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Ceramic production, distribution, and social interaction. An analytical approach to the study of Early and Middle Bronze Age pottery from Cyprus.

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Thesis submitted for the degree of Doctor of Philosophy (PhD)

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I, Maria Dikomitou confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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ABSTRACT

This thesis is a multi-dimensional investigation into the technology of Early and Middle Bronze Age (ca. 2400-1700 BC) pottery production in Cyprus, involving physicochemical analyses of raw materials and their processing, their possible provenance and the study of the various stages of the production sequence. In particular, macroscopic examination, optical microscopy, ED-XRF and SEM-EDS were employed for a combined petrographic and chemical study of different ceramic types for the reconstruction of ceramic production traditions, and the inference of possible networks of social interaction between contemporary settlements, as reflected in patterns of ceramic production and provenance.

This large-scale analytical project is developed through two case studies. The first is a comparative analysis of Red Polished Philia ware from the sites of Vasilia *Kylistra*, Philia *Vasiliko* and *Laksia tou Kasinou*, Kyra *Alonia*, Nicosia *Ayia Paraskevi*, Marki *Alonia*, Kissonerga *Mosphilia* and *Skalia*. The core focus of the second case study is the settlement of Marki *Alonia* from where various typical ceramic types were analysed for a diachronic technological assessment of pottery production and patterns of ceramic distribution at a single, well-documented settlement.

The general impression is that for more than seven hundred years ceramic production was primarily pursued at a local level with only minor imports from larger production centres. The only unambiguous patterns of raw material selection throughout this period are related to the production of Philia and cooking pot fabrics, and ceramic slips. The island-wide network of Philia inter-regional interaction, reflected in a technologically uniform Red Polished Philia ware, broke down on the threshold of the Early Cypriot I period into more regional patterns, reflected in a more diverse repertoire of Red Polished fabrics. A low degree of standardisation in ceramic production reappeared only in the Early Cypriot III period, when some attempts were made at better quality control.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ACF	Amorphous concentration features
CP	Cooking pot
CV	Coefficient of variation
CW	Coarse ware
DP	Drab Polished ware
EC	Early Cypriot Bronze Age
ED-XRF	Energy dispersive X-ray Fluorescence
ERS	Early Red Slip
HOB	Hob
KA	Kyra *Alonia*
KM	Kissonerga *Mosphilia*
KS	Kissonerga *Skalia*
LC	Late Cypriot Bronze Age
LC	Large closed vessel
LI	Lead Isotope
LO	Large open vessel
LOOM	Loomweight
MA	Marki *Alonia*
MC	Middle Cypriot Bronze Age
n	Number of samples analysed
NAP	Nicosia *Ayia Paraskevi*
PCA	Principal Components Analysis
PLK	Philia *Laksia tou Kasinou*
PV	Philia *Vasiliko*
pXRF	Portable X-ray Fluorescence
RP	Red Polished ware
RPC	Red Polished Coarse
RPCP	Red Polished Coarse Philia
RPP	Red Polished Philia
s	Standard deviation (sample)
SC	Small closed vessel
SCE	Swedish Cyprus Expedition
SEM-EDS	Scanning electron microscopy energy dispersive spectroscopy
SO	Small open vessel
TCFS	Textural Concentration features
VK	Vasilia *Kylistra*
WP	White Painted ware
μ	Mean
σ	Standard deviation (population)

<u>ACKNOWLEDGEMENTS</u>

Throughout the course of writing this thesis, I was frequently advised to understand, define and explain various patterns, ideas and concepts in an objective manner, focusing on my data, and not influenced by personal or other people's opinions in considering and presenting facts. The Acknowledgements section is for me an opportunity to be for once as subjective as possible and express in writing my sincere appreciation and gratitude to a large number of people who during the past years have made the realisation of this work feasible.

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This thesis is dedicated to my parents,
Agathi and George,

for teaching me through the years the true meaning of the words
love, dedication and hard work.

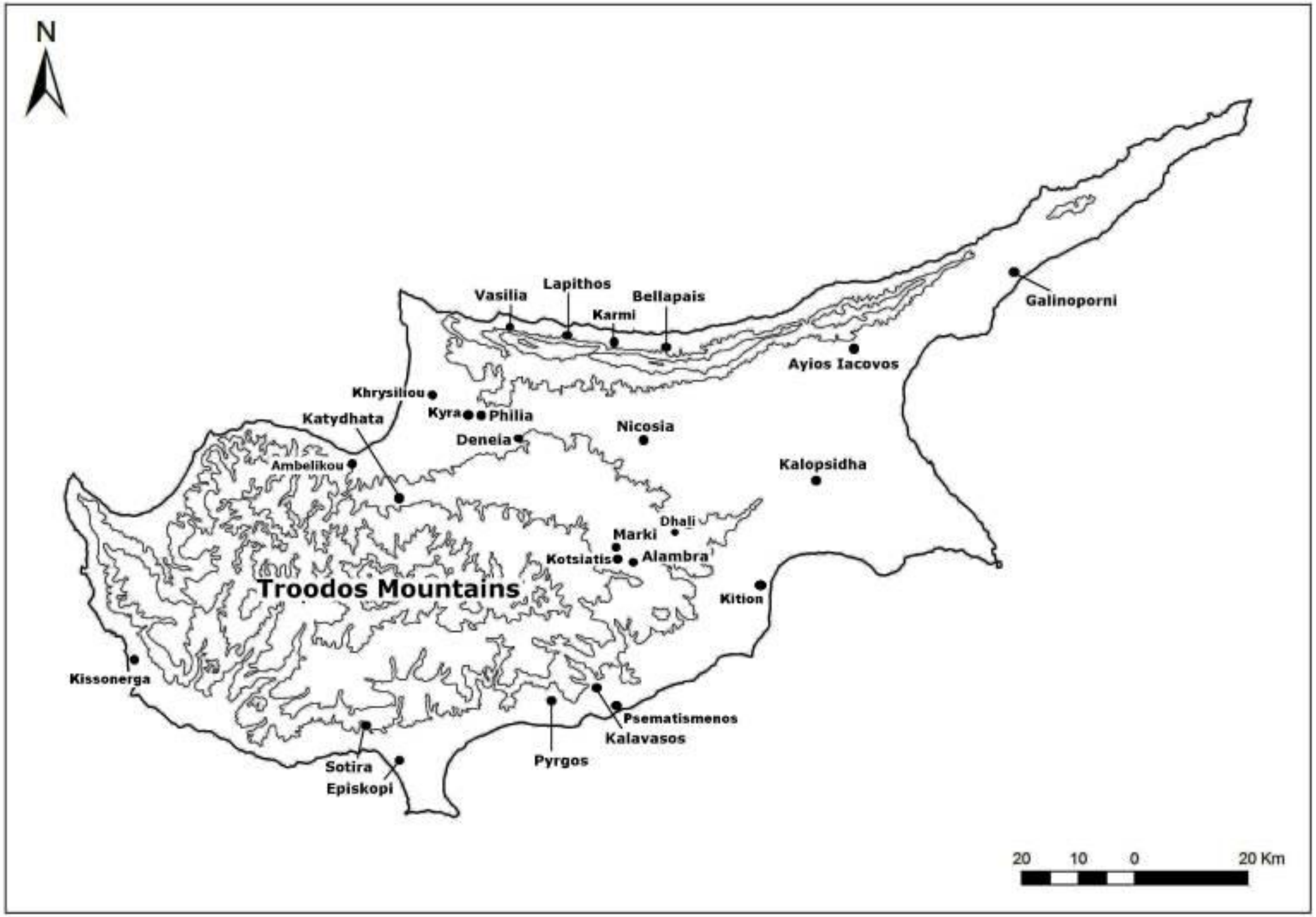

Figure I.1. Map of Cyprus showing the location of Philia, EC and MC sites.

CHAPTER I

INTRODUCTION – THE CURRENT STATE OF THE ART

> "May I put forward the preposition that the Early and Middle Cypriot civilisation, rather than being backward and resistant to progress, came close to being an ideal society? […] Early and Middle Bronze Age Cypriot society was probably based on the family and perhaps somewhat larger social units, but there was no great inequality in status or access to resources. […] And throughout this long time, above all else, they were able to remain in peace with one another. Modern society would do well to follow their example" (Coleman *et al*. 1996, xii).

I.1. Perspectives on the Early and Middle Cypriot Bronze Age. Issues of debate.

The Bronze Age has long been viewed as a turning-point in the prolonged history of Cyprus, a period during which the island underwent significant transformations towards urbanisation, cultural and technological evolution. Within the Bronze Age (**Table I.1**), there is a tendency to study the Early Cypriot (hereafter EC) and Middle Cypriot (hereafter MC) Bronze Age periods in unison, as the humbler predecessors of the Late Cypriot (hereafter LC) Bronze Age, which is widely considered as the apogee of these social, economic and cultural transformations.

Late Chalcolithic	2700 – 2500
Philia "Phase"	2500/2400 – 2200
Early Cypriot I-II	2300 – 2000
Early Cypriot III – Middle Cypriot I-II	2100 – 1700

Table I.1. The chronology of prehistoric Bronze Age Cyprus (original table by Knapp 2008, Table 1, 71). The dates used from Philia phase until MC II are those suggested for the chronology of the contemporary occupational phases at Marki *Alonia*. Suggested dates are based on radiocarbon determinations (Frankel and Webb 2006a, 35).

This thesis is a substantive attempt to highlight the importance of the study of the EC and MC periods and appreciate them as integral parts of the Cypriot Bronze Age cultural evolution in its long durée. The span of EC and MC has been referred to as the "prehistoric Cypriot Bronze Age" (Frankel 1988, 50-52; Knapp 1994a, 380) and covers more than half a millennium (**Table I.1**). During this time, Cyprus was introduced to the Bronze Age cultural system and a long and steady process towards the emergence of the first urban centres on the island began. What follows is a presentation of the Philia, EC and MC periods, with the aim to introduce the reader to the material culture, scholarly concepts and interpretations, and main issues of debate regarding the periods under study.

<u>I.1.a. The Philia debate.</u>

At the transitional stage between the Chalcolithic and the EC period, namely the Philia phase, the introduction of new technologies in different aspects of ancient Cypriot material culture, including pottery, metalwork, architecture, food processing and textile production, as well as the introduction of cattle and donkeys, signalled the beginning of the Bronze Age in Cyprus and provided the basis for the evolution of settlement patterns, and the local and regional networks of interaction (Georgiou 2006, 441). The Philia phase is transitional between the preceding Chalcolithic and the succeeding, fully developed, Early Bronze Age (**Table I.1**), when the last Chalcolithic, horticultural communities, such as Kissonerga *Mosphilia* gave way to the EC agropastoral settlements.

Since the discovery of the first "Philia" tombs by Porphyrios Dikaios in the 1940s, a long and prolific discussion has developed on the subject of the transitional stage between the Chalcolithic period and the fully developed Early Bronze Age, its chronological and spatial expansion and material culture, as well as the circumstances under which this culture came to exist. The first contrast of opinions appeared in written form in 1962, in a volume of the Swedish Cyprus Expedition (hereafter SCE) series, where Dikaios and Stewart (Dikaios 1962; Stewart 1962) clearly expressed their differing views "regarding the initial stage of the Bronze Age, the Philia culture, its origin, chronology and historic context" (Gjerstad 1962, v).

Dikaios suggested a sequential model, according to which the material from his excavations at Kyra *Alonia* and *Kaminia* and Philia *Vasiliko* (**Figure I.2)** should be attributed to the initial stage of the EC I period. His argument was principally based on the presence of "Red-on-White" [7] and Black Slip and Combed wares which seem to disappear during the EC period, as well as on the Red Polished (hereafter RP) repertoire, which includes shapes which either disappeared in time or evolved into more typically EC shapes (Dikaios 1962, 191). Moreover, Dikaios indicated that during this initial stage of the Early Bronze Age, a series of innovations were

[7] Dikaios, Stewart, and Gjerstad used different terminologies for the Philia wares. Dikaios' Red-on-White is equivalent to White Painted Philia (WPP) ware (*cf.* Frankel and Webb 1999, table 2).

observed such as the introduction of chamber tombs and a specific type of shell pendants; innovations which are characterised by western Anatolian traits, also reflected in pottery (Dikaios 1962, 202).

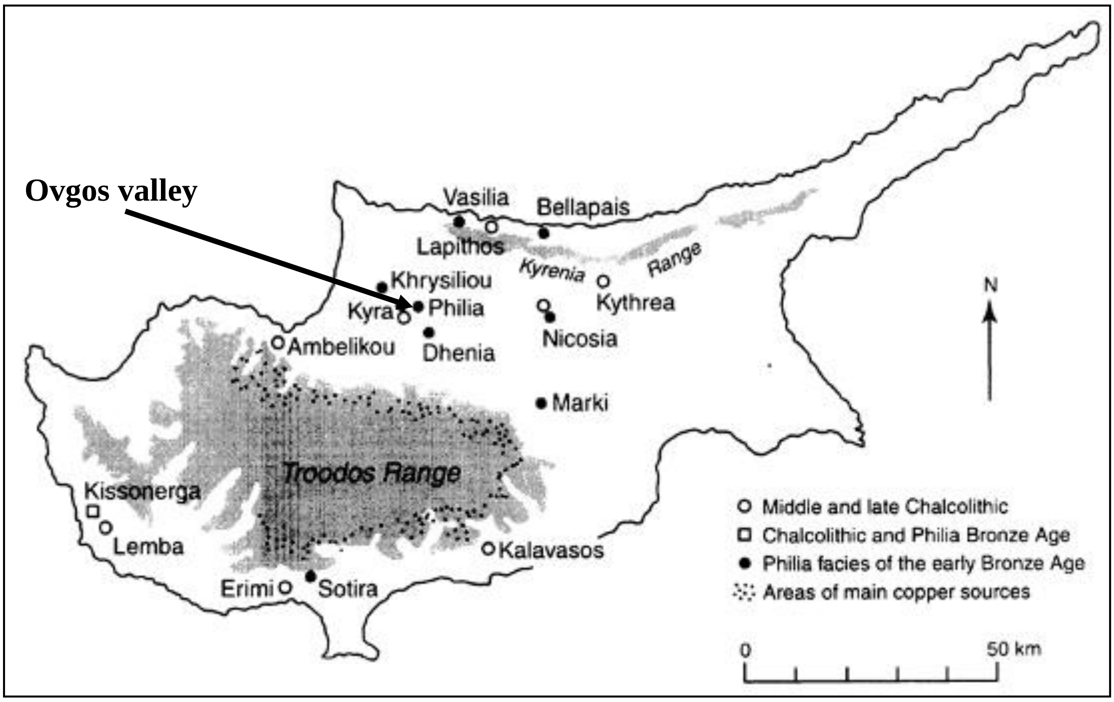

Figure I.2 Map of Cyprus showing major Late Chalcolithic and Early Bronze Age sites, as well as the location of the main copper sources in Cyprus (Frankel 2000, fig. 1, 169).

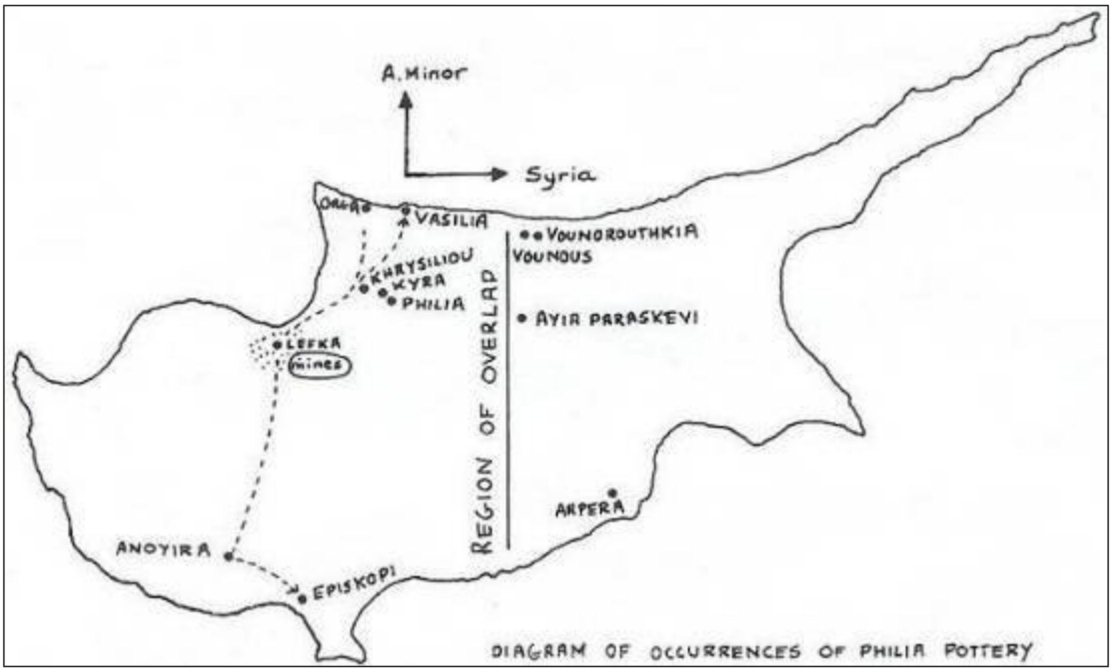

Figure I.3. Stewart's sketch map of Philia regional expansion (Hennessy *et al.* 1988, 40).

In constrast, J. R. Stewart regarded the Philia culture as a local phenomenon of western Cyprus (**Figure I.3)**, with its own series of pottery shapes and metal types, distinct from those of the EC period. According to Stewart, the Philia culture was certainly EC, but regional (Stewart 1962, 211; also Hennessy 1974a, 2); “contemporary with most, if not all, of the Early Cypriote series in other parts of the island, and that it then died out almost without a trace” (Stewart 1962, 210). Finally, Stewart always treated the Philia culture as a separate entity, “something aloof with no apparent influence of any significance outside its own area” (Stewart 1962, 211).

At this point it should be noted that both scholars’ arguments were exclusively based on material coming from small numbers of tombs, most of which were disturbed and very poorly published. With time, in the absence of stratified contexts, the Philia material was associated with a series of regional, temporal and other cultural explanations, and the cultural phase was addressed using different labels, including the “Initial stage of EC I” (Dikaios 1962), “Philia culture” (Stewart 1962) “Chalcolithic III” (Merrillees 1966; 1975), “Philia phase” (Manning and Swiny 1994) and “Philia facies” (Webb and Frankel 1999).

The first excavations to reveal Philia material in a settlement context were those at the Chalcolithic site of Kissonerga *Mosphilia*[8] on the south-west coast (**Figure I.2**), in periods 4 and 5 (*ca.* 2700-2400 B.C). This evidence first appears in period 4 in the form of spurred, annular pendants, which are otherwise better known from Philia contexts in the central plain (Peltenburg 1991a, 29; also Frankel and Webb 2004), but most importantly in period 5, which revealed substantial quantities of Red Polished Philia (hereafter RPP) pottery (Peltenburg *et al.* 1986, 37). Despite the fact that this evidence derives from upper, plough disturbed units, it is enough to suggest that “such ceramic changes in western Cyprus took place within a traditional circular architecture milieu”[9] (Peltenburg *et al.* 1986, 37), meaning that the pronounced cultural changes did not happen as a fundamental transformation but appeared, even though in limited form, already in the Chalcolithic period.

[8] The settlement at *Mosphilia* was occupied for an exceptionally long time by Cypriot standards, from the Late Neolithic (*ca.* 4500 BC) until the very beginning of the Bronze Age (*ca.* 2300 BC) (Peltenburg *et. al.* 1998, 16; Peltenburg 1991, 19-20). It was divided vertically according to material culture changes into five occupational units, period 5 being chronologically the latest.

[9] The circular type building, which characterises the Chalcolithic period, is replaced during the Bronze Age by a rectilinear type. This change in architecture is first noticed in the Philia phase and is only one of the many changes observed in material culture during this period.

Among the cultural changes that can be detected already in the Chalcolithic period, chamber tombs with funerary furniture appear alongside the traditional Chalcolithic pit graves that normally lack offerings, and multiple interments replace the Chalcolithic practice of individual burials (Peltenburg 1991a, 30). Some child urn graves were also found, a mortuary practice that is better known in Early Bronze Age I/II Anatolia (Peltenburg 1991a, 31). According to E. Peltenburg, the shapes of the vessels holding the child burials are analogous to those of the EC period rather than the Chalcolithic (Peltenburg 1991a, 31).

These Philia characteristics at the predominantly Chalcolithic settlement of Kissonerga *Mosphilia* provided for the first time a *terminus post quem* for the Philia culture (Peltenburg 1991a, 31). Furthermore, the combination of distinctive Chalcolithic and Early Bronze Age cultural elements in the latest occupational layers of Kissonerga suggests that there is no sharp break between the two periods and that the transformation happened in a patchy manner on the island, with more evidence for it in the north and around the Bay of Morphou (Peltenburg 1991a, 31).

The most significant evidence for this still elusive transitional period and its material culture was revealed in the late 1990s at the settlement of Marki *Alonia*. Considering the fact that Kissonerga *Mosphilia* period 5 is known solely from plough-disturbed deposits (Peltenburg *et al*. 1986, 37), and that the excavations at Kyra *Alonia* were limited to trial trenches without any evidence for architectural structures (Dikaios 1962, 152), it can be argued that Marki is the only settlement, at present, to reveal Philia material from stratified, domestic contexts. Marki not only offers the strongest evidence regarding the sequential position of the Philia culture, as the initial stage of the Cypriot Bronze Age, but also provides "an opportunity to see beyond individual objects and burials to a broader cultural system" (Frankel and Webb 2006a, 306).

When comparing the Philia material culture, as presented at Marki, with a range of artefacts found in other known Philia sites (*cf*. Webb and Frankel 1999), a distinctive cultural homogeneity is evident in all aspects of material culture, including metallurgy and textile technology, food preparation and consumption, personal ornamentation and pottery (*cf*. Webb 2002b; Frankel 2000; Frankel and Webb 1998; Webb and Frankel 1999). The changes and innovations observed with the new Philia cultural system are significant for the subsequent development of the Bronze Age cultural system. Among them, the introduction to the island of cattle and donkey should be given special emphasis; these animals, apart from their primary products, offered new opportunities for plough cultivation and transportation (Sherratt 1981). Moreover, the discovery at Marki of a casting mould incorporated in a wall dated to the Philia period, makes it the earliest mould to be identified in Cyprus and provides evidence regarding the spread of metal technology and production, and the distribution of metals at this early stage of the Bronze Age (Frankel and Webb 2001b; Fasnacht and Künzler-Wagner 2001).

Crucial to this discussion of cultural change is the origin of the Philia culture. Dikaios argued that the Philia ceramic shapes and styles present strong similarities to contemporary assemblages in western Anatolia, and specifically to EB II Tarsus (Dikaios 1962, 202; see also Goldman 1963). Mellink readdressed this argument from an Anatolian perspective, where

> "the rising need for metal supplies and metal working determined many of the regional and foreign relations of Anatolia, including Cilicia. It is in this context that the Chalcolithic Cypriot contacts can be analysed" (Mellink 1991, 168).

The results of Lead Isotope (hereafter LI) analyses conducted on metal artefacts dated to the Philia phase show that already in the second half of the third millennium BC, Cyprus was actively engaged in the Mediterranean metal trade, and that ring-ingots were imported to the island (Webb *et al.* 2006, 276). Evidence coming from both Cyprus and Tarsus shows a direct, reciprocal relationship between Cyprus and south western Anatolia, in which ceramic and metal artefacts were distributed to Cyprus from Anatolia and *vice versa* (cf. Mellink 1991; Webb *et al.* 2006).

The number of metal artefacts found in Philia tombs increases in comparison to the limited quantities found in Chalcolithic contexts. This increase could be the result of changing depositional patterns or the replacement of the small scale copper craftsmanship, already attested in the latest stages of the Cypriot Chalcolithic, by larger scale metal production during the Philia phase, or the result of both processes. Moreover, the LI analyses indicate that the metalsmiths of the island rapidly acquired the knowledge to deliberately produce arsenical copper, and gained access to imported tin and copper, which reached the island in the standard form of bronze ring-ingots, whereas the island in turn distributed its own copper in the form of perforated axe-shaped ingots (Webb *et al.* 2006; Frankel and Webb 2001b; Fasnacht and Künzler

- Wagner 2001)[10]. But the question still remains unanswered: how did these changes in metalworking and in every other aspect of material culture in mid-third millennium Cyprus happen?

The attempts to explain cultural change in Cyprus during the mid-third millennium BC vary, and include a series of differing models such as an entirely indigenous evolution with minimal influence from external factors (Knapp 1990; Manning 1993; Knapp 1993), a model of intensive contact with Anatolia (Mellink 1991), a limited migration from Anatolia (Swiny 1986), a migration of Anatolian settlers to Cyprus (Knapp 2008; Frankel 2005; Frankel 2000; Frankel and Webb 1998; Frankel, Webb and Eslick 1996; Dikaios 1962), and long-term cultural contacts antedating a migration episode (Bolger 2007; Peltenburg 2007). Moreover, these diverse views are further underpinned by a variety of arguments about the mode of social organisation and the degree of social complexity during the period.

Among the many interpretative models, at one extreme Knapp (e.g. 1990; 1993; 1994a; 2008) and Manning (1993) initially supported a model of socioeconomic and cultural transformation, which is a result of the establishment of "a new subsistence package (secondary products revolution), the intensification of copper metallurgy, and incipient demand for Cypriot copper from an interregional Mediterranean system" (Knapp 1993, 98).

The evidence used to support this argument primarily derived from mortuary data from the necropoleis of Vasilia, Lapithos and Bellapais on the north coast (**Figure I.1**), and especially their striking and unprecedented metal wealth (e.g. Stewart 1962; Balthazar 1990), which when compared with the more utilitarian copper artefacts found in settlement and industrial sites, was perceived as a strong indication for social differentiation (Knapp 1993, 98; also Manning 1993, 44). In addition, both scholars attempted to demonstrate differences in settlement size and numbers over time (Knapp 1993, 92-93; Manning 1993, 39-43), arguing that observed changes in site scale "requires the development of a more complex, central or hierarchical, social organization" (Manning 1993, 43).

Moreover, using Sherratt's secondary products revolution model (1981), Knapp argued that the introduction of the plough and cattle affected the island's ecosystem, and that "large tracts of cultivable land, specialised animal husbandry,

[10] The production of Cypriot copper gets more intensive and the metal is distributed in the well-known form of oxhide ingots in the fourteenth century B.C. (Webb *et al.* 2006, 170; Muhly 1991).

facilities for bulk storage, and an increased managerial level over the entire system promoted an efficient agropastoral economy and provided surplus for elites. Such a system supported supralocal as well as local administrative activities" (Knapp 1993, 98). "The new order of magnitude in agricultural production permitted elites to support and sponsor more specialised production activities" (Knapp 2008, 79; also Manning 1993, 47).

In parallel with the developments in agropastoral activities, Knapp and Manning argued that the introduction of new metallurgical technologies and the development of Cypriot metallurgy brought the island's isolation to an end. For Manning "trade is the key" (Manning 1993, 46) that brought Cyprus into contact with "the more advanced southern Anatolian civilizations" and "offered an incredible source of prestige, fashion, and influence to be acquired, emulated, and displayed by the emergent elite in Cyprus as an ingredient of power" (Manning 1993, 46). In a similar fashion, Knapp argues that intensified economic linkages within and outside Cyprus led the already "incipient" Late Chalcolithic social complexity towards the "emergence of social complexity" characterising the early stages of the Bronze Age (Knapp 1993, 100).

Thus, an anti-diffusionist interpretation was proposed, according to which the set of changes observed in every aspect of the material culture in the mid-third millennium was a result of indigenous developments associated with the expansion of Cypriot contacts with the outside world. During these indigenous developments, the local elites imported prestige items, used for social competition and the demonstration of status and power. However, these prestigious imports required a production surplus for exchange, which was enabled by the secondary products revolution and the development of metallurgical activities through the adoption of new metallurgical techniques. Moreover, these developments in agriculture, pastoralism and metallurgy enhanced the higher social and economic status of their privileged holders, contributing to social stratification and complexity.

However, more recently, Knapp's views on the origin and nature of the Philia culture have shifted in another direction, more in line with arguments expressed much earlier by Frankel and Webb (Knapp 2008, 103-130; Webb and Frankel 2007; Frankel 2005; Webb and Frankel 1999; Frankel and Webb 1998; Frankel, Webb and Eslick 1996). In contrast to his original model of internal social evolution, he argued a model favouring an initial migration of Anatolian settlers, who founded new communities initially in the north and then west, southwest and central parts of Cyprus around the mineral-rich foothills of the Troodos mountain range. These Anatolian settlers must have interacted in a peaceful manner with the indigenous population; a mode of interaction which led, on the threshold of the Cypriot Bronze Age, to the assimilation and integration of these differing ethnic groups (Webb and Frankel 2007; Frankel 2005; Webb and Frankel 1999; Frankel and Webb 1998; Frankel, Webb and Eslick 1996).

	MIDDLE CHALCOLITHIC	**EARLY BRONZE AGE**
Agriculture	Hoe-based agriculture Sheep, goat, pig, deer used for primary products	Plough-based agriculture Cattle, donkeys, sheep, goat, pig, deer with greater use of the secondary products
Architecture	Single-roomed circular houses Central hearths Limited rebuilding and reuse Mud-wall construction	Multi-roomed rectilinear architecture Hearths against side walls Constant renovation and rebuilding Mould-made mud-brick
Burial	Common placement of graves within the settlement area Limited quantity of grave-goods	Primarily burial in cemeteries well outside settlements Large quantity of grave-goods
Textiles techniques	No evidence available	Specially made terracotta whorls for low-whorl spindles Clay weights for warp-weighted looms
Anthropomorphic representation	Cruciform figurines and figures predominantly associated with child-birth	Abstract "plank-shaped" female figures, and complex genre scenes showing a wide array of activities
Ceramics	No direct-fire boiling pots Vessels without handles Painted decoration	Specifically made cooking pots Vessels with handles attached by tenons Incised decoration
Metallurgy	No significant use of copper	Wide array of copper tools and other items
Food preparation	No boiling or stewing in pots	Cooking pots for boiling, stewing
Settlement distribution	Concentration in richer, better watered coastal regions	Increased occupation of inland areas of lower rainfall especially in proximity to copper sources
Raw material distribution	Limited distribution of small quantities of prized stone (picrolite)	Significant distribution of copper from source areas
Social organisation	Fluctuating scales of social complexity and hierarchies of power and status	Stable, perhaps relatively egalitarian system

Table I.2. A summary of differences between the Cypriot Middle Chalcolithic and Bronze Age (Frankel 2005, table 4.1, 21)

The main evidence to support this proposed migration of people from south-western Anatolia is the exact series of innovations, and the range and nature of new skills and technologies. This range of cultural changes includes different approaches to the preparation and consumption of food, new ways of crafting textiles, metals and ceramics, innovations in agriculture and pastoralism, different structure and use of the built environment, and changed mortuary and childcare practices (Webb and Frankel 2007, 193-203; Webb 2002b; Frankel 2000, 171-178, **Table I.2**).

According to Frankel, all these changes, distinguishing the Philia cultural system from the preceding Chalcolithic and introducing the Bronze Age to the island, are firmly associated with specific patterns of everyday behaviour, which cannot be easily imitated or transferred, but can only be adopted through patterns of learning from people who are already part of the specific cultural system (Frankel 2000, see also Bourdieu 1977). All these new cultural elements (**Table I.2**) are bonded with a specific cultural mentality, a specific way of doing things, scheduling the daily program, a new perception and interaction with the surrounding social and physical environment, different from the established Chalcolithic cultural package, and thus conceived as strong indicators of a migration movement to the island (Webb and Frankel 2007; Frankel 2000; Frankel and Webb 1998).

The strong cultural parallels in south-western Anatolia suggest the movement of Anatolian settlers to the island (Frankel, Webb and Eslick 1996). The newcomers must have settled at first in the north-western foothills of the Troodos mountain range, where the copper ores are located, overlooking the Mesaoria arable plain. According to Frankel and Webb's model, there is no reason to expect signs of conflict due to the different economies, based on different technologies and raw materials (Frankel, Webb and Eslick 1996, 50), and the movement of the newcomers into areas unattractive to the indigenous hoe-based agriculturalists (Frankel 2002, 176). The two ethnic groups could have coexisted in peace for some time, the newcomers maintaining a distinct identity suggested by the great cultural homogeneity characterising the dispersed Philia sites (Webb and Frankel 1999).

Even though there is no specific evidence for the initial settlements of these new settlers in Cyprus during the mid third millennium BC, we can however see the differences between the new cultural system introduced to the island and the existing indigenous Chalcolithic. In time and through contact, it is argued that the interaction between the two groups led to their integration and acculturation, in a process of "becoming Bronze Age" (Frankel 2005). This gradual process of acculturation could have involved the exchange of products, as well as people, ideas and knowledge. "Acceptance and adoption of different technological and concomitant behaviour must be seen to take place at different rates and in different ways. There is no single line of progression, but a complex of varied processes operating at different rates" (Frankel 2005, 23).

Knapp more recently accepted that people from southern Anatolia had sustained contacts with Cyprus over an extended period during the mid-late third millennium BC, but he still questioned the transfer of ideas, technologies and practices from the "technologically superior (Anatolian) colonists, or migrants, vs. indigenous (Cypriot) communities" (Knapp 2008, 104). In Knapp's view, the cultural evolution that led to the island's introduction into the Bronze Age was "a transformational process of hybridization" (Knapp 2008, 110), a combination of "Anatolianising" and locally derived cultural features recombined into new elements of material and social practice through the process of hybridization (Knapp 2008, 125).

As Knapp argues, his main point of contradiction with Frankel and Webb is that the socio-cultural changes observed at the very beginning of the Cypriot Bronze Age were not "directly introduced" to the island (Webb and Frankel 1999; Frankel and Webb 1998; Frankel 2000; Frankel 2005; Webb and Frankel 2007; Knapp 2008, 109), but "the meeting and intermixing of different cultural groups resulted in entirely new material forms and social practices, without assuming any form of technological (or cultural) superiority" (Knapp 2008, 128). This argument implies long and gradual internal processes extending for at least several generations after the initial movement of southern Anatolians to Cyprus, the results of which we see in the currently available Philia material record.

A third model that lies somewhere in between the aforementioned models, has been proposed by Edgar Peltenburg (2007) and Diane Bolger (2007). According to this model, the establishment of the Philia cultural package on the island is an end result of a long process of contacts with West Anatolia, archaeologically already seen in the Late Chalcolithic period, between ca. 2800/2700-2500/2400 BC (Peltenburg 2007, 144). "The Philia, in other words, was not an entirely new phenomenon, it was a development within increasingly intensified relations with Anatolia" (Peltenburg 2007, 144). Furthermore, Bolger raises the questions of why and how the Philia cultural change took place, and emphasises the importance of examining the Chalcolithic contacts prior to the actual migration events (Bolger 2007, 166-167).

Peltenburg uses the Late Chalcolithic introduction of spouted pouring vessels, the careful surface treatment of red and black burnished vessels, and the adornment of the vessels' surfaces with plastic decoration, cultural features with analogies in northeast Aegean and west Anatolian sites, as important indices for "the existence of a Cypriot-East Aegean[11]/West Anatolian orientation in East Mediterranean earlier 3rd millennium BC interactions, independent of and prior to the Philia phase" (Peltenburg 2007, 147, 150-151). He also evokes the presence of metal artefacts and spurred annular pendants already in pre-Philia contexts at Kissonerga 4a, to justify his argument (Peltenburg 2007, 152). Furthermore, in an attempt to define the social environment in which the aforementioned changes took place in Late Chalcolithic Kissonerga, and to address important questions such as how and why these changes took place during the early third millennium BC, Bolger draws attention to technological and decorative attributes attested in contemporary pottery types, technological changes observed in pottery assemblages from Middle and Late Chalcolithic, and draws conclusions in relation to the social context in which these ceramic types were produced and used (Bolger 2007, 173-175).

The study of ceramics at Kissonerga *Mosphilia* and neighbouring Lemba *Lakkous* shows that the typical pottery type of the Early and Middle Chalcolithic, namely Red-on-White ware, is replaced in the Late Chalcolithic, from ca. 2800 BC onwards, by Red and Black Stroke Burnished ware, which comes in new shapes and presents close affinities with southern and western Anatolian pottery (Bolger 2007, 173; also Peltenburg 2007, 150-151). Moreover, Bolger argues that this new type of pottery is technologically different and more advanced than earlier ceramic types, particularly in terms of paste preparation and firing. The Red and Black Stroke Burnished ware presents greater standardisation in shape and size, an observation especially apparent for bowls (Bolger 2007, 174).

The technological advances and high degree of standardisation in the production of Red and Black Stroke Burnished ware led Bolger to argue that by the Late Chalcolithic, pottery making exceeded the household level to represent "small scale specialisation" (Bolger 2007, 175), and should be considered in the context of broader changes that are associated with expanded contacts of the islanders with

[11]It should be mentioned that until very recently there was no direct evidence in the Cypriot archaeological record to support contacts with the Aegean before the EC III period. The very limited Aegean imports to Cyprus comprised an EM III / MM I A bridge-spouted jar found in an EC III tomb at Lapithos, and a MM II Kamares cup found in a MC I tomb at Karmi (Webb *et al.* 2009; Catling 1973). However more recently, LI analyses on EC metal artefacts have shown that at least some of these objects were made with metals coming from the Cyclades (Webb *et al.* 2006).

Anatolia, as well as local demand for pottery characterised by greater efficiency in manufacturing techniques (Bolger 2007, 182). Considering the stylistic and technological changes observed in pottery and other categories of material culture, as well as social practices, Peltenburg and Bolger argue that contacts with Anatolia should have preceded the migration of Anatolian settlers to Cyprus, and interaction with Anatolia should be sought already in the Chalcolithic period.

Therefore, in the wider context of interaction, which flourished in the Early Bronze Age II period between the north-east Aegean and western Anatolia (Kouka 2008a; Broodbank 2000), Cyprus should not be excluded (Peltenburg 2007). If indeed these intra-Mediterranean contacts were established in the beginning of the 3rd millennium BC, then by the mid third millennium this interaction was intensified, representing the last stage of Renfrew's "international spirit" (Kouka 2008a, 278; Broodbank 2000), in which the Philia culture in Cyprus should be placed. An initial period of contacts between Cyprus and Anatolia during the Cypriot Late Chalcolithic provides a context for the subsequent migration events and explains how the migrants came to know the island prior to any decisions for population movements. Considering this argument more carefully, a period of contacts prior to any migration events seems a prerequisite, as migration attempts to unknown lands sound highly doubtful.

On the other hand, the intensification of metalworking and the introduction of new sets of serving and drinking vessels have been used as evidence for an alleged degree of social complexity (Kouka 2008a, 278). In Cyprus, the emergence of social hierarchy was considered initially an integral prerequisite of an internal evolution model explaining contemporary cultural change (Manning 1993; Knapp 1993; Knapp 1994b). Particularly, Knapp argued that it was indigenous elite that took advantage of foreign demand for metals, which became the main motivating factor for Bronze Age cultural transformations (Knapp 2008; Knapp 1994b; Knapp 1990; also Manning 1993).

In his recently reviewed argument, Knapp maintained his belief that:

> "accelerating overseas and interregional communications led to an ever more disproportionate rate of innovation between elite and non-elite groups. The gap between domestic- or lineage-based production of non-specialist products (pottery, clothing, subsistence goods) and the town-centred production of specialist products (copper for export, metals,

> other prestige goods) continued to grow – albeit sporadically and to different extents in different regions –" (Knapp 2008, 111).

This is one of the main topics of dispute among archaeologists, and it is not only focused on the Philia cultural phase, but extends to the EC and MC periods. On the basis of the divergence between opinions, rest the different methodological approaches to the study and interpretation of material culture, as well as the shift of research focus on differing contexts and geographical regions. The scholars favouring an emergent social complexity (e.g. Knapp 2008, 82-87; Peltenburg 1996, 21-27; Peltenburg 1994, 158-159; Knapp 1994a, 419-421; Manning and Swiny 1994, 166; Knapp 1993, 94-95; Manning 1993, 44-48) base their arguments primarily on information coming from mortuary contexts, the prestige symbolism of metal deposition in graves, anthropomorphic figurines and scenic relief representations on elaborate ceramic vessels. Moreover, they argue that both the expansion of metallurgical (seen in the increase of metal objects deposited in tombs) and agricultural (a result of the introduction of cattle as "an animal source of energy") activities should be associated with an augmented control of resources by an emergent elite; and this asymmetrical social organisation was further emphasised by controlling access to prestige imports resulting from long-distance contacts.

A different methodological approach is taken by those scholars arguing for the existence of an essentially egalitarian society throughout the EC and until well into the MC period (e.g. Frankel and Webb 2006a; Frankel 2002; Webb 2002a; Frankel 1988). In contrast to the study of symbolic iconography and prestige symbolism most directly represented in funerary contexts, Frankel and Webb rather focus on settlement material, namely that from Marki *Alonia*, undertaking a series of different analyses including curate and discard strategies (Frankel and Webb 2001a; Webb 1998), household establishment, expansion, replacement and abandonment processes (Frankel and Webb 2006b), settlement size and population estimates including the Marki cemeteries and burials, as well as the excavated households (Frankel and Webb 2001a).

In Frankel and Webb's work the household becomes the core analytical unit, as "the most common social component", whence "individuals articulate most directly with each other, and with economic, ecological and subsistence processes" (Webb 2002a, 88). No evidence is found for communal storage facilities, beyond the household level, which could otherwise justify some sort of control over production or surpluses by a specific group, and which shows "that both production and consumption networks were restricted to immediate household numbers" (Webb 2002a, 92). Moreover, their studies of curate, discard and abandonment processes suggest:

> "a stable household regime, primarily organised to meet the needs of subsistence agricultural production and the maintenance of domestic technology and the co-residential unit. Both craft production and agricultural activity appear to have been principally organised at the household level, with most or all households engaged in a similar range and scale of subsistence, maintenance and reproduction tasks" (Webb 2002a, 93).

It is obvious that different methodological approaches, objects, contexts and geographical regions for analysis provide different sets of data, and therefore different standpoints for opinions and arguments. Contemplating this debate, it is apparent that the limited settlement and material evidence is a significant drawback, which should not be underestimated. Currently the only settlement which provides Philia material at a household level is Marki *Alonia* in the centre of the island, and there is a total lack of settlement information in areas such as Vasilia on the north coast, where some of the wealthiest Philia tombs have been found. Consequently, there is still a big gap in research regarding the Philia phase, and the debate about the degree of social complexity becomes quite polarised, as opinions are divided depending on the various scholars' objects of scrutiny and standpoints.

<u>I.1.b. Early and Middle Bronze Age Cyprus. Issues of debate.</u>

Similar debates are involved in the study of the fully developed EC and MC I and II periods. According to Swiny, the division between the EC and MC periods is arbitrary (Swiny 1989, 16), as there is no clear distinction between the two periods in terms of their material culture. This is evident in all three EC and MC settlements which have been systematically excavated and published in detail: EC-MC Marki *Alonia* (Frankel and Webb 2006a; Frankel and Webb 1996) and MC I Alambra *Mouttes* (Coleman *et al.* 1996; also Gjerstad 1926) are both located in the centre of the island, close to the northern foothills of the Troodos Mountain range, whereas EC Sotira *Kaminoudhia* (Swiny *et al.* 2003) is located in the south (**Figure I.1**).

Marki *Alonia* is currently the only settlement on the island to provide stratified material from Philia to MC II, coming from successive, domestic contexts. Other excavated settlement sites include MC I Ambelikou *Aletri* (Merrillees 1984), EC II-III Episkopi *Phaneromeni* (Carpenter 1981; Catling 1962, 150), MC III Dhali *Kafkallia* (Overbeck and Swiny 1972), EC-MC Pyrgos *Mavrorakhi* (Belgiorno 2002, 1999, 1997, 1995) and EC-MC Kalopsidha (Åström 1966). However, the evidence from these sites is scanty, incompletely published and in many cases ambiguous or controversial (Barlow 1982, 5).

Current depictions of Early and Middle Bronze Age Cyprus portray "an island inhabited by scattered rural communities with a dual polarisation: copper production coupled with trade on the one hand, agriculture and pastoralism on the other" (Swiny 1989, 14). The agricultural and metallurgical techniques introduced during the Philia cultural stage provided the basis for the rise of a dynamic, introverted, insular economy. The flourishing technological, cultural and economic dynamism is primarily reflected in the foundation of the new EC and MC settlements[12], and steady population growth during these periods (*cf*. Frankel and Webb 2007; Frankel and Webb 2001a; Swiny 1989). The introverted, insular economy of EC and MC Cyprus is argued by the very restricted presence of imported artefacts recovered on the island (see overview of EC and MC imports: Knapp 1990, 152). Any external contacts during this time seem to have been directed by the northern part of the island, which must have operated as the gateway to the outside world. It should be noted that all imports to the island during the EC and MC periods were recovered in tombs located in northern Cyprus.

In addition to the small number of excavated settlements, survey projects have also contributed significantly to our knowledge of settlement patterns (e.g. Catling 1962; Swiny 1981; Todd 1986; Given and Knapp 2003; Georgiou 2006). It seems that water and arable land were the two most important factors for habitation (Swiny 1989, 17; Swiny 1981, 80), as the majority of recorded sites are located in the river valleys. On the other hand, there are also some sites surrounding the Troodos cupriferous foothills (**Figure I.1**), suggesting that at least some communities, in addition to the cultivation of land and breeding of animals, were exploiting the adjacent copper

[12] EC and MC settlements are founded at locations where no preceding human habitation is recorded.

resources and were involved in metallurgical activities, involving the mining and processing of copper.

Ambelikou *Aletri* is currently the earliest mining site in Cyprus, dated to the nineteenth century BC, and located in the northern Troodos foothills (Merrillees 1984; Muhly 1989, **Figure I.1**). The site was only investigated in a very limited way before modern mining activities destroyed it (Knapp *et al.* 2001, 205). The metallurgical evidence, in the form of small fragments of slag, moulds and crucibles at the settlements of Marki *Alonia* (Frankel and Webb 2001b; Fasnacht and Künzler-Wagner 2001), Alambra *Mouttes* (Gale *et al.* 1996) and more recently Pyrgos *Mavrorakhi* (Belgiorno 1999; 1997), indicate that activities associated with the primary smelting as well as casting of copper took place in these EC and MC settlements (Frankel and Webb 2006a, 191).

It should also be stated that defence appears not to have been one of the primary considerations in the selection of settlement locations. In addition to the total absence of perimeter walls encircling the settlements (Swiny 1989, 17), the EC and MC household compounds can be dispersed over large areas, without any natural or artificial protection (Coleman *et al.* 1996, 327). Overall, it seems that the EC and MC villagers lived in peaceful conditions, with a generally low level of conflict of the kind encouraging the need for defensive locations or fortification (Frankel and Webb 1996, 1).

On the threshold of the EC period, the preceding Philia island-wide material uniformity and unified network of interactions seem to be replaced by a more diverse material culture with characteristics of a growing regionalism, primarily reflected in differing ceramic styles (Frankel 2009; 1994; 1993; 1981; 1974a; 1974b Herscher 1981; 1991; Maguire 1991; Merrillees 1991). Even if the currently available settlement record is relatively limited, it can at least be argued that the disintegration of the Philia homogeneous cultural system and the emergence of cultural regions on the island is a result of the system's own success in founding communities, which gradually grew and became more self-reliant, at least within their regional setting (Frankel and Webb 2006a, 307).

Within this EC-MC island-wide "remarkably durable cultural *koine*" (Swiny 1989, 18), the local variations observed "at different scales of detail and space" (Frankel 1993, 61) can be attributed to local geology, topography and differences in locally available raw material resources (for tomb variability see Frankel and Webb

2007, 146; for building material variability see Swiny *et al.* 2003, 59-66), between contemporary communities. EC and MC regionalism is first and foremost reflected in pottery and it is the most frequent debate that reoccurs in any scrutiny of the EC and MC culture. Regionalism, in the context of Cypriot archaeology,

> "is broadly understood to indicate cultural differences which can be identified between different parts of the island, often using the major topographic divisions to provide a natural framework for establishing "cultural areas"" (Frankel 2009, 15; *cf.* Bolger 1989).

Bolger (1989, 142-143) observed that regional approaches in Cypriot archaeology are quite animated, and involve several attempts at internal regional divisions of the island. Earlier and more recent divisions (Gjerstad 1926; Catling 1962; Price 1979; Georgiou 2006; Satraki 2010) employ geographical, geological, topographical, and artefactual criteria for dividing the island into regional areas. However, it should be emphasised that in the absence of written sources, these cultural divisions of Cyprus are quite abstract, and cannot be visualised as the actual borders of cultural regions; they are conceived to depict clusters of interaction and cultural homogeneity that are stronger within their groupings rather than between them (Frankel 2009, 15).

"The ultimate aims of regional analysis in archaeology lie beyond the plotting of sites and documentation of regional groups; and there is more to cultural cartography than drawing lines" (Bolger 1989, 143). Ultimately, the central idea behind regional analysis in archaeology is the definition of regional entities with socio-political and economic connotations that facilitate deductions of historical significance (Merrillees 1979, 116-117). While the precise borders of these regional entities remain elusive, the regionalised character of the EC and MC culture should not be overlooked. On the contrary, it should be examined more closely, since these regional structures provided the basis for the configuration of the second, most important, formative horizon in the island's culture[13], namely Late Bronze Age urbanisation (Iacovou 2008, 223; also *cf.* Peltenburg 1996).

> "Geographically Cyprus is dominated by two mountain belts, the Northern (Kyrenia) range and the Troodos massif in the south-west.

[13] According to Iacovou (2008, 223), there are three important episodes in Cyprus' early history. The neolithisation of the island is followed by Bronze Age urbanisation, the third formative horizon being the hellenisation of the island.

> Between them lies the fertile Mesaoria plain, and both the South and North coasts have comparatively narrow belts of rich flat agricultural land between the mountains and the sea. The tongue of the Karpass peninsula, pointing significantly towards Syria, and the broken country of the Paphos district in the West form separate entities. […] There must have been much individual isolation tending to form local schools of culture […].” (Stewart 1948, 119-120).

While the degree of isolation of the various parts of Cyprus has been refuted by subsequent studies, the overall division of the island, suggested by Stewart, shares many common elements with succeeding attempts at dividing the island into regional areas (Catling 1962; Price 1979; Georgiou 2006; Satraki 2010). The geological structure of the island, the morphology of the landscape, and in particular the two mountain masses delimiting the Mesaoria plain in the centre of the island, its natural passages, water bodies, and natural resources, must have played an important role and significantly affected the formation of the social setting, human habitation and interaction throughout the history of Cyprus.

The copper resources of the island, located around the Troodos mountain range, are considered to be among the most significant economic factors affecting the formation of interactive patterns. These ore bodies, covered by the series of pillow lavas and other extrusive igneous rocks, can be found on both the north and south sides of the Troodos mountain range (Constantinou 2002, 59-60). Frankel (1974), as well as Stewart before him (1962) argued that one of the primary motivating factors in inter-site interaction was the mining, production and exchange of metals and metal artefacts. This concept has been fundamental in the formation of arguments about the location and role of specific settlements in the EC and MC economy, as well as the networks of inter-settlement interaction, primarily reflected in pottery inter-site similarities (e.g. Stewart 1962; Frankel 1974; Frankel and Webb 2006; Frankel and Webb 2007; Crewe 2007).

If copper was a “crucial commodity for export and exchange”, and these routes of interaction were indeed guided by the metal exchange networks, it is the ceramic evidence which remains the archaeologically visible by-product of these interactions (Crewe 2007, 2, 12), and becomes the means to trace and understand these inter-site economic and social networks. Pots could be transported, exchanged and distributed for many and differing reasons, such as products, gifts, souvenirs, booty, or any other type of social communication (Frankel 1974a, 47), or as by-products in the exchange of other types of products, such as metal artefacts, or metal raw materials (Crewe 2007; Frankel 1974a, 48).

Moreover, ceramic variability has been extensively used cross-culturally for the definition of cultural areas and patterns of regional interaction and exchange. The first island-wide attempt to understand regionalism was published in 1974 by Frankel, who studied the distributional patterns of decorative motifs on White Painted pottery (hereafter WP) to trace the networks of interaction among MC communities, and define the contemporary regional sub-divisions of the island. Since then, the issue of regionalism has become a significant point of enquiry in most studies focused on the EC and MC periods, and pottery has become the primary tool for addressing this issue. More recently, Georgiou's doctoral thesis has argued that the morphology of the Cypriot landscape, its geographical and topographical features, have played a significant role in the development of settlement patterns, as well as inter-site relational patterns and regional development (Georgiou 2006, 455).

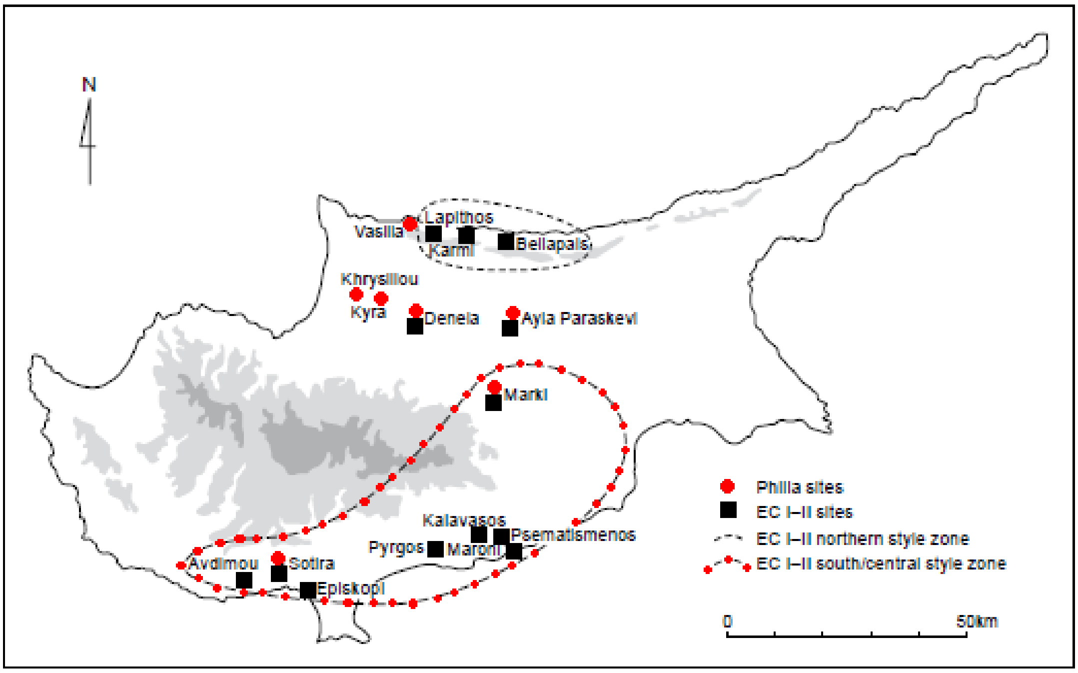

Figure I.4. Suggested EC I-II regional zones of interaction (Webb and Frankel 2008, plate 1, 287).

From EC I onwards the ceramic culture on the island suggests the existence of two broad cultural zones (Webb and Frankel 2008b). One cultural region is comprised of settlements located on the north coast, and the other by settlements located in the southern end of the central plain and south coast (**Figure I.4**, Webb and Frankel 2008b). These interaction clusters are primarily based on ceramic stylistic similarities, which continued to exist and define these cultural areas until MC II/III, when many of these sites were abandoned.

Distinct ceramic types and styles characterise and differentiate the ceramic production of the north coast from that of other parts of Cyprus. Henessy's so-called "Lapithos artist", the work of whom is characterised by "antithetically opposed concentric and hatched semicircles or triangles used to give a final divided diamond or circle pattern" (Hennessy 1974b, 22), has been acknowledged to form part of a well-established RP regional style characterising the north coast, and not the work of an individual (Frankel and Webb 2007, 105, 154; Webb and Frankel 2001).

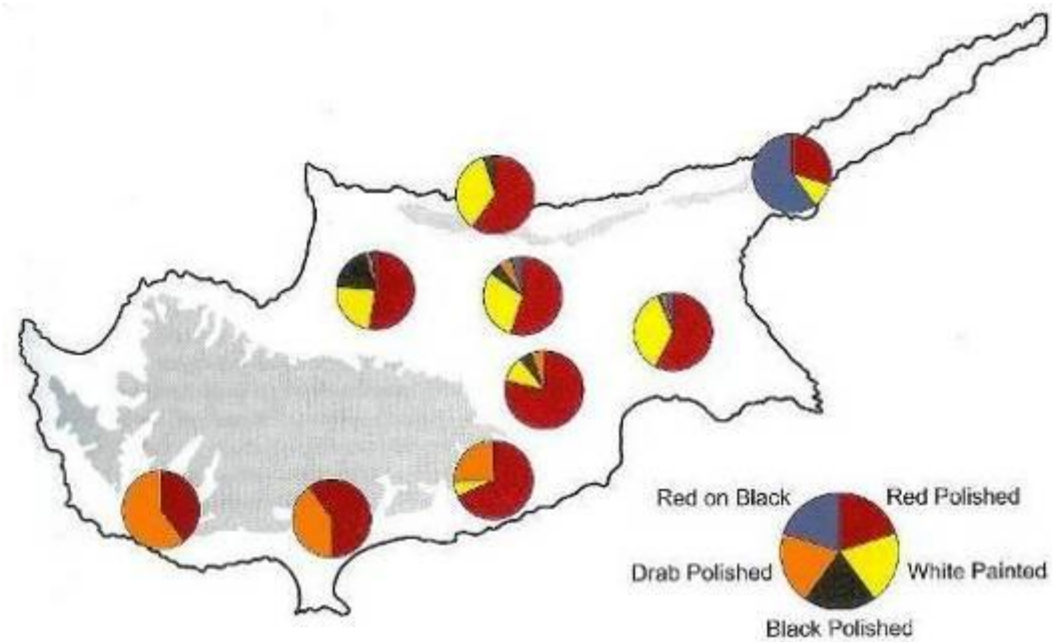

Figure I.5. Spatial variation in the occurrence of main MC wares (Frankel 2009, 21, fig.2).

The ceramic assemblages from sites in the central and south parts of the island, such as Marki, its neighbouring Alambra, Kition, Psematismenos, Episkopi and Kalavasos, suggest that although some contacts with the north were in place, these areas constituted a largely independent region of interaction (Webb *et al.* 2008, 102; Cullen and Wheeler 1986, 155). These strong central-south links are testified by the increased production of Drab Polished (hereafter DP), which is essentially the local EC III-MC I variation of RP in the south-west part of the island[14] (Crewe *et al.* 2008; Webb *et al.* 2008, 102; Philip 1983; Herscher 1976), the near absence of WP in the south-west (Webb *et al.* 2008, 102; Frankel 1974a), as well as the absence of

[14] The DP ware seems to account for more than seventy per cent at Ammoudhia and Skalia and it seems that the main difference between RP and DP is in firing techniques (Crewe *et al.* 2008).

Black Polished (hereafter BP) in the southern and western parts of the island (Frankel and Webb 2007; Webb and Frankel 2001, **Figure I.5**).

Nonetheless, this link between the central and south regions did not forestall contacts with other settlements, outside this interaction area. At Marki, for example, the presence of RP I north coast flasks with incised decoration (Frankel and Webb 2006a, 119), as well as a number of stylistic and typological similarities between a small number of Marki RP specimens and those from Lapithos, *Vounous*, and other northern sites, indicate that some contacts, even though limited, were in place. Considering the recovery of two multiple bar ingot moulds in a wall at Marki dated in phase D (EC I-II), and that the settlement could produce copper ingots for off-site distribution, it could be argued that pottery was distributed along with metal, with a possible ultimate destination in the richer settlements and associated harbours of the north coast (Frankel and Webb 2006a, 317)

In addition to the two regional zones depicted in **Figure I.4** perhaps the most multifaceted phenomenon is observed in the central plain, where various interactive patterns both with the north and the south seem to exist. This more complex picture of social interaction, in the centre of the island, is believed to be a result of the location of these central settlements next to the copper sources, which intensified their communication even with settlements at a considerable distance (Frankel 1978, 157).

As Catling argued, the central plain offers an easy west-east route from coast to coast facilitating the circulation of materials (Catling 1962, 135). This argument can explain, for example, the stylistic link observed between Lapithos, Deneia and Kotsiatis (**Figure I.1**). According to Frankel,

> "Kotchati is near the copper resources, and Deneia is on the route toward one of the only two reasonably good passes through the Kyrenia Mountains which lie between Lapithos and the centre of the island. It is probable that this similarity in decorative appreciation is related to a contact based on the exploitation of copper" (Frankel 1978, 156-157; also Frankel 1974b, 203-204).

Similar patterns of stylistic similarity are also visible in other EC and MC wares, such as RP and BP, and even in MC III RP IV, BS II and RS (Frankel and Webb 2007, 155).

Earlier studies by Stewart (1948) and more recent studies by Webb and Frankel (Webb and Frankel 2001; Frankel and Webb 2007; Webb 2010), have argued that an organised ceramic industry was in operation during the MC period at Deneia, producing pottery with "an overtly local ceramic signature" (Webb 2010, 179). "This is visible in a strong pattern of attribute co-variation (vessel form, motif, technique) that distinguishes the Deneia assemblage within the island-wide Red Polished tradition" (Webb 2010, 179; also Frankel and Webb 2007; Webb and Frankel 2001). Overall there is relatively limited circulation of pottery outside Deneia, and pottery similarities between this large MC production centre and other settlements in Cyprus are confined to an area of roughly 30 kilometres around the site (**Figure I.6**, Frankel and Webb 2007, 155).

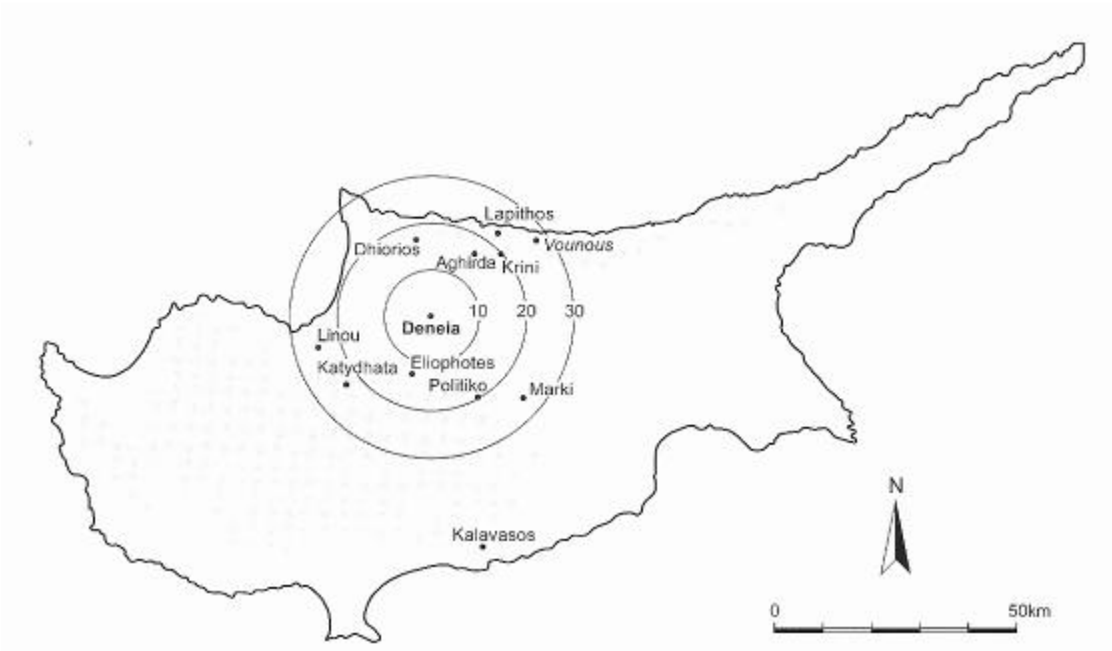

Figure I.6. Deneia and sites with evidence of Deneia ceramics in MC I-II (Frankel and Webb 2007, 156, Text Figure 8.8).

If Deneia was the predominant ceramic production centre in the west part of the central plain, another large settlement must have probably also existed at Nicosia *Ayia Paraskevi*, in the eastern half of Mesaoria. Nicosia *Ayia Paraskevi* is the only other recorded settlement on the island with a comparable occupation like Deneia, founded in the Philia period and continued from then on without interruption (Frankel and Webb 2007, 163; Georgiou 2002; Kromholz 1982, 2). Despite the fact that this settlement has been lost under the modern city of Nicosia, the archaeological record deriving from the dispersed tombs (Georgiou 2002; Frankel 2001; Kromholz 1982) testifies that *Ayia Paraskevi* must have been throughout the Cypriot Bronze Age a focus of occupation. Moreover, the stylistic study of RP and WP pottery from *Ayia Paraskevi* suggests that ceramic styles and types conformed to a distinctive style

(Frankel 2001, 10). Despite the relatively restricted amount of ceramic material from *Ayia Paraskevi* – in comparison, for example, with the vast quantities of pottery from Deneia – a "Nicosian" stylistic character is clearly visible, implying local production of pottery at this area.

It is emphasised that these regional settlement clusters should not be visualised as separate patterns of interaction that happened to coexist on the island. On the contrary, as Frankel argued "it is not appropriate to divide the island into sharply differentiated, discrete units. While there are clear local preferences, the boundaries around style zones display a gradual fall-off in similarity with distance" (Frankel 1991, 249). In this sense, regional groupings overlap and settlements closer to each other exhibited stronger social ties than those distant from each other, without implying a total absence of contact between remote communities (Frankel 1991, 249).

EC-MC regionalism is a phenomenon closely linked with pottery studies, and cannot be recorded clearly in any other category of material culture, essentially because there are not large assemblages of any other type of material culture. For this reason, many scholars have criticised, even questioned the scale of EC-MC regionalism and the attention given to ceramic regional variation. For example, Knapp argued that

> "although regional factions or polities certainly existed during both the PreBA (prehistoric Bronze Age) and the ProBA (protohistoric Bronze Age), the primary criterion used to identify them has been the identification and classification of ideal pottery types. Without denying the importance of regionalism, in particular for the relative chronology, it must be emphasised that such an approach blurs the more dynamic aspects of production and tends to overlook broader social or spatial patterns" (Knapp 2008, 134).

Following the same line of thought, Manning wrote:

> "a number of scholars have perceived regionalism to be a dominant theme in all Cypriot prehistory. Typically such views are entirely derived from ceramic evidence, and are, as such, modern constructs. Criticism may be made. For example, relatively minor differences in ceramic decoration and form may be explained through factors centred in local production, and small-scale, kin based interaction, without resort to any putative higher level socio-political organisation or true geographic separation (Frankel 1974a; 1982; 1988; 1993[15]). An alternative to original suggestions of a fundamental west-east split on

[15] References included in quote provided by Manning (2001, 80).

> Cyprus throughout the MC period (Åström 1957, 275; see previously Gjerstad 1926), may, for instance, be offered via such criteria" (Manning 2001, 80).

Both Manning and Knapp have criticised the focal attention given to pottery assemblages, arguing that this approach prohibits scholars from capturing the broader picture, focusing only on certain types of pottery. Considering the two scholars' critical assessments of ceramic regional studies, a question that arises is how else could EC and MC material culture be studied. At present, pottery is the only material category adequately represented in the archaeological record of the Early and Middle Bronze Age in Cyprus. Moreover, almost all of the recovered material dated to these periods belongs to tomb assemblages, which are more often than not unstratified. The extremely limited amount of settlement material, as well as the comparatively restricted number of artefacts belonging to other material categories, make any attempts at understanding the contemporary social interaction configurations and social structure very difficult, almost impossible, let alone any type of investigation into other aspects of production.

Addressing in particular Manning's concerns, Frankel (2009) and Webb (2009) bring forward the example of Deneia, where "the regional – perhaps even more local and site specific – differentiation (**Figure I.6**) was deliberate and recognised (an emic indication of difference) and not one only identified in archaeological analysis" (Frankel 2009, 23; also Webb 2009; Frankel and Webb 2007). Frankel continued by arguing that "we should recognise that all archaeological analyses are modern constructs, and even where they were never recognised, perceived or understood by people in the past they are useful to us" (Frankel 2009, 23). This final statement should be supplemented by adding that modern constructs are useful, as long as they are well-supported by archaeological evidence. Available data should be of key importance in any type of archaeological interpretation, and when it comes to the EC and MC periods, the only substantial data-pool is contemporary ceramic assemblages.

Therefore, it is no coincidence that the first observations related to ceramic similarity or variability among sites, and consequently the first divisions of the island into cultural zones, emerged in parallel with the first attempts at classifying the vast corpus of Bronze Age ceramics (Gjerstad 1926, Åström 1957, Stewart 1962). Already in 1948, Stewart made references to "particular peculiarities" in ceramic repertoire

(Stewart 1948, 135), and argued that "local variations in style are already visible in EC I, and by EC III the differences between certain areas are clear" (Stewart 1948, 136).

Stewart's observations essentially provided the basis for the development of the idea of regionalism in the archaeology of the EC and MC periods. Particularly, the next generation of Australian archaeologists, including Merrillees, Hennessy and Frankel, inherited this conception of regionalism, which is evident in their studies of Cypriot Bronze Age ceramics, but adopted to serve different ends. As Frankel (2009) argued "it is possible to draw a distinction between two approaches to ceramic regionalism: one which looks to explain this phenomenon in terms of social and historical processes and the other which sees it less as a research problem to explore than a technical problem to be overcome or exploited in order to establish chronological systems" (Frankel 2009, 23).

This second approach to regional variation is further exemplified by Merrillees (1991, 238-239):

> "what these geographic and/or cultural suffixes have done is merely to give due recognition to the importance of regional diversity in the mainstream of a particular ceramic sequence. Just as Åström saw the scope for elaborating the terminology of the White Painted series to allow for stylistic off-shoots with geographic associations (1966, 80-93)[16], so Herscher and Swiny have not hesitated to expand the range of Red Polished Ware titles to take account of new regional variations and have added to the repertory terms such as Red Polished III Mottled[17], together with, of course, Red Polished Punctured. Herscher (1973) has independently identified a Red-and-Black-Polished Ware from the western Karpass, […], and Hennessy has sought to attribute certain decorative styles in the Red Polished series to individual artists. These styles are, of course, once again nothing more than regional variations".

Merrillees (1991) underlined that in order to fully understand the relationships between regional variants and their chronology, the existing pottery classification should undergo significant changes, "infinite adaptation and expansion, without consequent loss of intelligibility or credibility" (Merrillees 1991, 239). As will be discussed below, many other researchers have tried to expand EC and MC ceramic

[16] References as provided by Merrillees (1991, 239).

[17] This term has been proven misleading. The identification of vessels of this type from Psematismenos *Trelloukkas* Tomb 1/82 and elsewhere is incorrect. According to Frankel and Webb, they represent a chronologically earlier variety of RP and not a regional or technological variant of RP III (Frankel and Webb 2006a, 106).

classifications, using different terminology, trying to define ceramic variability within classes of pottery and/or regional variation between site assemblages.

Most of these studies (e.g. Maguire 2009; Barlow 1996; Barlow and Vaughan 1996; MacLaurin Hemsley 1992; Barlow 1991; Herscher 1991; Maguire 1991; Herscher 1988, Barlow and Idziak 1989; Herscher 1976**)** were very successful in recording typological, technological, and stylistic variations within and between ceramic assemblages from various sites, but none of them really addressed broader issues related to aspects of ceramic production at regional and island-wide levels, or the social inferences that can be made based on the recorded ceramic similarities or variations within and between assemblages. Is, in that sense, the detailed classification and reclassification of ceramics into groups and sub-groups really useful?

The answer came from David Frankel in the volume of the proceedings of the first ever symposium on Cypriot prehistoric ceramics (Barlow, Bolger and Kling 1991). According to Frankel, a research approach that "differs markedly from the traditional all-encompassing typologies and the islandwide frame of reference championed by Merrillees" (Frankel 1991, 241) is essential, in order to

> "look outside this neat structure and to see the archaeological record, not as a neat set of entities, but rather as a *field* – a multidimensional field within which some attributes may group themselves together in some dimensions but not in others, with differing degrees of uniformity and variation, homogeneity and diversity, and with fuzzy, complex and overlapping boundaries" (Frankel 1991, 242-243; *cf.* Frankel 1988).

Frankel's research on both WP and RP wares (Frankel 1974a; 1974b; 1978; 1988; 1991; 1993; 1994) is essentially a sustained attempt to construct the social dimension of ceramic distribution, defining the networks of circulation among settlements and consequently the channels of social interaction. This type of study is cross-culturally founded on the interaction hypothesis or the social interaction theory (Rice 1987, 252). This approach to ceramic attribute analysis, and primarily the analysis of ceramic styles, tried to expand the capabilities of ceramic studies beyond the dating of sites, "isolating individual elements of pottery design and explain their spatial occurrence in terms of the social behaviour of the makers and users of the pottery" (Rice 1987, 252).

Common artistic and stylistic traits among settlements presuppose close relationships and contacts, and ceramic attribute similarity can be measured and be used as an indication of the degree of contacts between social groups (Frankel 1978, 147-148). Therefore, while the more formal typological approaches inherently generate and set boundaries, which make any attempt at measuring social interaction difficult, attribute analysis can indicate different models of varied degrees of interaction (Frankel 1993, 60).

A very important initial step related to ceramic attribute analysis, prior to any attempts at arguing about the degree of inter-settlement social interaction, is the definition of the degree of ceramic uniformity or variability within and between site assemblages. This is an important first step for the recognition of useful patterns and for understanding the extent of ceramic traditions and technologies. It also provides the groundwork for appreciating different scales of analysis, separating models of local variation from island-wide stylistic and/or technological preferences.

On a cross-cultural level, various theoretical and ethnographical studies (e.g. Rice 1981; Hagstrum 1985; Benco 1988; Sinopoli 1988; Costin 1991; Rice 1991; Blackman *et al.* 1993; Clark 1995; Costin and Hagstrum 1995; Skibo and Feinman 1999; Arnold 2000; Roux 2003) have considered if and how ceramic variability can address issues related to standardisation, craft specialisation, social complexity and interaction. This is still a topic of constant dispute; the criteria and preconditions for measuring and defining ceramic standardisation are still debated, as well as how material standardisation can actually be linked with specific modes of production and degrees of craft specialisation.

Focusing on the EC and MC periods, apart from Frankel's work (1994; Frankel 1991; Frankel 1988; 1974a; 1974b) and a more recent article by Frankel and Webb (2001a), discussions about the organisation of ceramic production are absent in the EC and MC literature. Frankel initially argued in favour of local, small-scale production units (Frankel 1981, 96-97), to revise his argument in more recent years and propose with Webb a "model of elementary specialisation" ((Frankel and Webb 2001a).

This "model of elementary specialisation" in ceramic production (Frankel and Webb 2001a, 126) is based on population estimates during the lifetime of the settlement at Marki and estimated household pottery discard/replacement rates.

> "If the intensity of ceramic production and therefore the level of specialisation is determined by need, the basic unit of pottery production is unlikely to be the individual household when their

> replacement requirements fall below a level of economic efficiency. […] In the case of Marki, where replacement rates per household were probably below a dozen vessels per year, production requirements may have been more efficiently met by a small number of local potting households engaged in part-time manufacture and exchange" (Frankel and Webb 2001a, 126).

As they noted, this "model of elementary specialisation" can also explain the low degree of standardisation characterising the EC and MC pottery assemblages, as a small number of households were producing pottery for local production and thus pottery production still remains small-scale and localised (Frankel and Webb 2001a, 126).

These are the only discussions about the mode of organisation of EC and MC pottery production, and while analytical methodologies have been employed in the past for the study of ceramic material from the main three excavated EC and MC settlements (Vaughan 2003; Summerhayes *et al.* 1996; Barlow 1996; Barlow and Idziak 1989), these earlier petrographic studies were essentially restricted to the compositional and technological characterisation of ceramic samples, without any substantial attempts at addressing issues related to the degree of ceramic distribution or local production at any of the given sites, or issues related to local or regional techniques and styles versus island-wide traditions. These studies tended to agree with Frankel's argument that while minor typological and stylistic differences distinguished separate regions, the overall techniques of production seem to have been uniform all over the island, suggesting that a broad, island-wide ceramic tradition was in place (Frankel 1981, 96; Frankel and Webb 1996, 110-111).

Despite the very restricted number of efforts to evaluate ceramic production and distribution based on tangible and measurable archaeological evidence, and the absence of direct evidence regarding pot making activities[18], there is a significant body of contradictory – and largely unjustified – discussion about the degree of craft specialisation and, most importantly, the mode of social organisation during these periods of Cypriot prehistory. In some cases, craft specialisation is simply assumed,

[18] It should be noted that there is no direct evidence regarding ceramic workshops and tools in the archaeological record of the EC-MC Bronze Age. Åström referred to the presence of misfired pots at Kalopsidha (1966, 138) and Merrillees identified a potter's workshop at the site of Ambelikou *Choma tis Galinis*, which included "in one of its corners a primitive kiln for baking pots" (1974, 47). Except this scarce information, there is nothing in the published archaeological record – including the publications of the three settlement sites – that can be directly associated with pottery production activities, such as clay washing, mixing, storing, forming, drying or firing (Frankel and Webb 2001a, 127).

without further attempts at explanation, to be linked with the existence of a stratified society (e.g. Manning 1993; Knapp 1993; Knapp 2008), or in opposite cases a low degree of craft specialisation is related with the existence of a more egalitarian model of social structure (e.g. Frankel 1993; Frankel 2002; Webb 2002a; Frankel and Webb 2006a). As has already been mentioned in relation to the Philia debate, scholarly contradictions originate in differing research approaches and different, if not incompatible, archaeological contexts of study.

It should also be highlighted that the vast majority of material assemblages dated to the EC and MC periods was recovered from thousands of tombs across the island. This imbalance between settlement and mortuary material has been one reason for the fragmented and highly disputed picture we have of EC and MC society, its structure and organisation. While some scholars do not see any visible differentiation in architecture or any evidence of social hierarchy in domestic contexts (Frankel 1993; Coleman *et al.* 1996; Frankel and Webb 2006b), others argue in favour of a prestige-goods exchange system which is firmly associated with the emergence of elite groups (e.g. Knapp 2008; Knapp 1993; Manning 1993).

For this latter group of scholars, in favour of a growing class of elites in EC-MC, the cultural changes that enabled the development of Bronze Age culture, such as the use of the axe and the plough, the reintroduction of cattle, and the adoption of several aspects of the "secondary products package" played a significant role in the transformation of EC and MC society (Knapp 2008, 78-79). The intensification of agricultural activities provided the basis for a "new order of magnitude in agricultural production" allowing the elite groups to "support and sponsor more specialised production activities" (Knapp 2008, 79; also Manning 1993). Finally, in Knapp's words,

> "Larger tracts of arable land, specialised animal husbandry, facilities for (household) storage and an increased level of managerial control over the entire system, all served to promote a more efficient agro-pastoral economy, provided a surplus that elites mobilised and manipulated, and thus helped to satisfy the social, economic, and ideological needs of elites and commoners alike" (Knapp 2008, 79).

Nonetheless, it should be emphasised that these arguments are exclusively theorised from mortuary data and that there is no available evidence from settlement contexts to support any of the aforementioned interpretations of "specialised production activities", "storage and an increased level of managerial control", or social differentiation in wealth between "elites and commoners". On the contrary there is not a single contemporary settlement that is distinguished for its size, scale, complexity, elaboration in architecture or number of foreign imports (Swiny 1989, 25), and "there is nothing in the nature of the internal fittings or in systemic discard residues to suggest significant differentials in economic capacity or in acquisition or consumption behaviour" (Frankel and Webb 2006a, 314) among households within any excavated community.

Similar observations were also made by the excavators of the other two well-documented settlement sites, Sotira *Kaminoudhia* and Alambra *Mouttes*. Swiny and his collaborators argue that some evidence to suggest "a special status" was only observed in units 2 and 12 at *Kaminoudhia*. Both units were open courtyards which appear to have had lime-plastered or white washed walls, a feature which is not found elsewhere in the settlement (Swiny *et al.* 2003, 54). In association with the presence of ash, numerous small drinking bowls, a large spouted bowl and other vessels often of uncommon types, these courtyards were linked by the excavators with cult (Swiny *et al.* 2003, 54).

Other than that, there is nothing else in the architectural plan of Kaminoudhia to suggest a differentiation in the building material, size or equipment of individual households. In addition, no other evidence has been found in any of the excavated settlement sites to infer some sort of public character for any of the recovered buildings. "An apparent absence of public or private buildings significantly larger than the norm and of any particular focus or authority or wealth in the village layout" is also observed at the settlement of Alambra *Mouttes*, the excavators of which argue that the community inhabiting the settlement was an egalitarian one (Coleman *et al.* 1996, 329).

In this discussion about the degree of social complexity during the EC and MC periods, the two main foci of contradiction involve on the one hand the settlement material in the southern and central regions, and on the other, the unprecedentedly wealthy cemeteries of the northern and central regions. The differentiation in material wealth among the cemeteries of the north coast and the central and southern parts of Cyprus is the most significant factor generating debate. The EC I – MC II tombs at Karmi *Lapatsa* and *Palealona* (Webb *et al.* 2009), the EC II-MC II/III cemetery at Lapithos *Vrysi tou Barba* (Keswani 2004, 43; Stewart 1962; Gjerstad *et al.* 1934) and the EC I-MC II funerary sites at Vounous (Keswani 2004, 42; Dunn-Vaturi 2003) are distinguished from all other mortuary sites due to their unparalleled wealth of funerary deposits, including metal artefacts, ‘cult’ and complex ‘multiple vessels’ (Webb and Frankel 2008b; Keswani 2004). These northern tombs are not only differentiated in the range and wealth of artefacts deposited but they also document a diachronic increase in wealth expenditure and energy investment in tomb construction (Keswani 2005).

It is no coincidence that the very few coastal sites are almost exclusively found on the north coast (Swiny 1989, 18). This pattern of habitation suggests a model of introverted, domestic-oriented agricultural economy, with only a restricted number of contacts with the neighbouring lands during the early periods of the Cypriot Bronze Age, which were facilitated by the presence of these coastal staging posts on the north coast (Knapp 2008, 73).

If the material assemblages found at the cemeteries are considered suggestive of the corresponding settlements’ wealth, then it can be expected that the settlements that used the necropoleis at Vasilia, Lapithos and Bellapais would have been of a considerable size and wealth, with which the more modest, currently excavated settlement sites cannot compare. To this extent an hypothesised copper trade has been argued to have played a significant role. A different picture applies in the south-central region, where there is no evidence associated with accumulated wealth or prestige displays in mortuary contexts. Published tomb assemblages coming from a variety of localities in the central and southern parts of the island (e.g. Sneddon 2002; Georgiou 2001; Georgiou 2000; Herscher and Swiny 1992; Todd 1985; Kromholz 1982) do not show, in any case, the depositional variety and wealth recorded in tombs located on the north coast.

While comparisons among the cemeteries in the north and those located in central and southern Cyprus suggest that those in the north are differentiated and more elaborate than those in the centre and the south of the island, representing either a very different cultural behaviour, or much greater access to wealth, it should be noted that the inadequacy of settlement data in the central and south parts of the island, and the total absence of settlement information in the north, do not allow at present the construction of arguments related to the organisation of the society during the EC and MC periods, and any attempts at this sort of interpretation are ill-supported. It is proposed that a research focus towards the currently available archaeological material should be made and alternative ways of study should be sought, in order to approach the EC-MC society indirectly, via its available material remains.

I.2. From description to analysis. An historical review of Cypriot Bronze Age archaeology with special reference to pottery studies.

A trip back in time to examine the circumstances under which Cypriot archaeology came into existence and evolved is necessary for two main reasons. This examination will reinforce our understanding and appreciation of the long way that the discipline has come during the last couple of centuries, and particularly during the last thirty-five years, but most importantly it will contribute to our understanding of what current knowledge has to offer, how this knowledge has developed, its fundamental assumptions, its limitations, and what needs to be done next.

The year 1974 is a landmark not only for the history of Cypriot archaeology, but for the history of Cyprus. The division of the island into two parts and the illegal occupation of the northern part by Turkish military forces have forced its isolation from any research activities in accord with UNESCO's International conventions[19], which prohibit as illegal any archaeological fieldwork in the occupied territory of the Republic of Cyprus. Consequently, in this short appraisal of the history of Cypriot archaeology, the year 1974 is viewed as a turning point for archaeological research.

Examining the literature before and after 1974, it becomes clear that Cypriot archaeology has been transformed through time from merely a practice of hunting oeuvres of art to a well-established, scientific discipline for the study of past Cypriot societies. This evolutionary process can be perceived when examining the archaeological handbooks of the nineteenth and early twentieth centuries (*cf.* Palma di Cesnola 1877; Myres and Ohnefalsch-Richter 1899; Gjerstad 1926; Newman 1940).

It would not be groundless to say that the grandfathers of Cypriot Archaeology are a large number of foreign consuls, diplomats and officials, who had a great interest in the antiquarian wealth of the island, which was for several centuries under successive foreign occupations. Goring (1988, 4) argued that many of them, while interested in personal gain, had also a genuine interest in the past of Cyprus (i.e. Sir Robert Hamilton Lang and Thomas Backhouse Sandwith). Overall, it seems that in

[19] See the 1907 Hague Regulations; the fundamental 1954 Hague Convention on the Protection of Cultural Property during Armed Conflict, its Regulations, and its subsequent Protocols; the 1949 Geneva Conventions and Protocols; and the 1993 UNESCO Declaration Concerning the Intentional Destruction of Cultural Heritage.

the broader sense of *orientalism* (Said 2003), contemporary colonial expansionism, as well as contemporary laws, encouraged many foreign collectors to create their personal excavation teams, led most of the time by local foremen, to explore the antiquarian treasures of the island.

Beyond “learning, discovery, and practice” (Said 2003, 73), after excavation the antiquities were directed to the black market, private and museum collections. One of the largest collections coming from these early “excavations” is that housed in the Metropolitan Museum of New York. The thousands of finds exhibited were unearthed by Luigi Palma di Cesnola (Palma di Cesnola 1877). According to the Metropolitan Museum’s website, after his appointment in 1865 as the American consul in Cyprus, Cesnola gradually “outmatched” antiquarians coming from other European countries and “came to dominate the scene in Cyprus” (Metropolitan Museum of Art 2008). In most cases, there are no written accounts of these “exploitations”, which were intensified during the nineteenth and early twentieth centuries, when foreign consuls and officials based on the island “encouraged the villagers to seek out antiquities for them” (Goring 1988, 3).

From this “mischievous” era, what is important to this thesis is the attitude taken towards the ancient artefacts *per se*. Whether for personal profit or genuine interest in the ancient past, the vast numbers of finds were admired, treated, and in the best of cases, recorded as “objects of curiosity or beauty”, which would enrich private and museum collections around the world, frequently without any additional references to their provenance, let alone the specific context in which they were found. It should also be mentioned that even in those cases where published records exist, they do not really include the entire material assemblage recovered, but rather the most exotic and beautiful specimens. The “cruder” pottery and sherds, for example, were left *in situ*, reburied or discarded without any examination or documentation.

Conversely, it should be noted that the first excavations in Cyprus and the first attempts to record the archaeological material are again mostly associated with diplomatic missions on the island, and especially the British colonial administration. In the preface to the renowned *Catalogue of the Cyprus Museum* by Myres and Ohnefalsch-Richter, it is stated that “the British occupation of Cyprus in 1878 marks the close of what may be called the mythical age of Cypriote archaeology, and has accordingly been taken as a convenient starting point” (1899, viii).

Indeed, the first attempt at a classification of Cypriot pottery should be credited to the British Vice Consul in Cyprus, Backhouse Sandwith, who already in 1877 published in *Archaeologia* his finds in a chronological sequence, without however mentioning anything in particular about the exact provenance of the material (Goring 1988, 13). As Gjerstad later wrote: "Sandwith was the first to distinguish between the Bronze Age and Iron Age in Cyprus by observation of the different styles of pottery found in the ancient tombs excavated – or rather robbed – at the time" (1926, 262).

Moreover, the foundation of the Cyprus Exploration Fund in 1887 was another significant attempt, which with the blessings of the High Commissioner of Cyprus became part of a broader initiative to control the excavations carried out on the island, and "transform these investigations into a more scholarly enterprise" (Goring 1988, 22). At the close of the nineteenth century, the publication of the *Catalogue of the Cyprus Museum* (Myres and Ohnefalsch-Richter 1899) and the concern to actually record the material owned by the Cyprus museum, was an important step towards archaeological documentation.

The Swedish Cyprus Expedition (hereafter SCE) should be considered another immense step forward. Directed in the 1930s by the young Einar Gjerstad, the SCE "endeavoured to explore the Cypriote culture on a large scale employing the scientific methods of modern field archaeology, with the object in view of publishing a comprehensive work dealing with the history and culture of Cyprus from the Stone Age down to the end of the Roman era" (Gjerstad *et al*. 1934, xiv). Indeed, it was the first time in the history of Cypriot archaeology that some attention was given to stratigraphy, the context and description of artefacts. The extensive volumes published by the SCE remain today indispensable guidebooks for all those studying Cypriot Archaeology.

In the years to follow until 1974, a significant number of excavations were conducted at important Cypriot archaeological sites. As Claude Schaefer writes "Cette nouvelle impulsion est due aux fouilles enterprise de 1927 à 1931 par l' expédition suédoise […]" (Schaeffer 1936, vii). The SCE gave a new impulse and encouraged other museums and research institutions to exploit the island. The French team, for example, directed by Schaeffer, worked under permits granted by the successive British High Commissioners and in close collaboration with the Cyprus Museum, and in particular with Porphyrios Dikaios (Schaeffer 1936, viii), and like the Swedish expedition, excavated at various sites on the island, dated to different periods.

At this point it should be noted that until 1935, contemporary laws encouraged the export of ancient material to different countries around the world. The Law on Antiquities established by the Ottomans in 1874 and maintained for half a century by the British, stated that the excavated antiquities should be divided into three; one third belonged to the Government, one third to the owner of the land and the remaining third to the excavator (Department of Antiquities 2009).

Therefore, until 1935 and, ironically, always in accord with contemporary laws, a vast number of antiquities found their way to foreign institutions and museums around the world (such as the Museum of Mediterranean Antiquities (Medelhavsmuseet), Stockholm, the Institutionen för Klassik fornkunskap och antikens historia, Uppsala, the Nicholson Museum, Sidney, the Ashmolean Museum, Oxford and the Metropolitan Museum of New York), and site assemblages were divided into separate collections and scattered. As Åström observed, only rarely did excavated tomb groups remain intact when material was dispersed to different museums (Åström 1957, 164-165), emphasising the value placed on individual artefacts, not on understanding them in context. This dispersion of assemblages, in addition to the long use of tombs, which prohibited the stratigraphical understanding of the sequence of material culture, made and continues to make the study of Bronze Age material culture difficult.

It was in 1935 that the British started setting stricter rules with regard to excavation projects and finally founded the Department of Antiquities, which replaced the previous *Museum Committee*. Following the already established tradition which encouraged diplomats to be highly interested in and directly involved with the antiquarian past of the island, the first director of the Department of Antiquities was a diplomat called J.R. Hilton, who was succeeded by the young architect A.H.S. Megaw, who remained the Director of the Department until the independence of Cyprus in 1960.

The establishment of the Department of Antiquities and its jurisdiction over all excavation activity on the island and all archaeological material was of immense importance for the more scientific study of the island’s past. From 1935 onwards, the only excavation projects legally active were those under permits from the Director of the Department of Antiquities, which prohibited the splitting of assemblages and demanded written reports on the excavations undertaken (see also Herscher and Swiny 1992).

The new regime resulted in more methodical attempts at ceramic classification. Sandwith's (1877), Myres' (1899; 1914) and Gjerstad's (1926) classifications were succeeded by those proposed by Åström (1957) and Stewart (1962) in their publications for the Swedish Cyprus Expedition. Specifically, Stewart gave emphasis to the variable of shape within the Red Polished (hereafter RP) series, whereas Åström emphasised fabric and decoration within the White Painted (hereafter WP) ware. Moreover, Åström was one of the first to distinguish chronological and regional differentiation in ceramic styles (Barlow 1982, 19).

A new era in Cypriot archaeology was established, during which various projects were initiated on the island with a true interest in the ancient history of Cyprus, beyond any sterile art historical interest. As Merrillees wrote about Stewart, and this could apply to most of the archaeologists emerging on the archaeological scene from the 1940's onwards, Cyprus ceased to be considered "as a pawn in an international game of shifting power and diplomacy, but as a self-respecting entity worthy of study in its own right and on its own merits" (Merrillees 1983, 45-46).

During this new era, the first studies of pottery essentially remained focused on style, and that is why the original names used to distinguish the various types of pottery derived from their most obviously visible physical characteristic (Merrillees 1978, 15) (e.g. Red Polished, White Painted, Black Slip and Combed, Red Slip, Red-on-Black). Consistent with archaeological practices elsewhere, the major catalogues of pottery published, among them those included in the SCE volumes IV 1A and 1B (Åström 1957; Stewart 1962), describe in detail ceramic shapes and decoration, but fail to acknowledge the social and functional dimensions of pottery. The lack of detailed analysis and theoretical justification, as well as the scarcity of stratified material, made these classification systems mechanical and difficult to use. As Barlow wrote in her doctoral thesis "typology should be used to discern order within a body of material and not to impose a pattern" (Barlow 1982, 22).

Moreover, issues of ancient technology were barely discussed. In the 1950s one of the first attempts was made to use experimental archaeology for the replication of impressions found on several pottery sherds from *Vounous* in order to show that baskets were used to support the vessels' bodies during manufacture (Crowfoot and Crowfoot 1950). This attempt showed that some basic technological considerations related to ceramic manufacture were beginning to complement ceramic stylistic studies. However, more systematic technological studies were made after 1974, as will be discussed in detail below.

Stewart himself acknowledged that discussions about the technological attributes of pottery were still absent from Cypriot ceramic studies. Referring to his own classification system (Stewart 1962), he admitted that

> "except for my pottery from *Vounous* information about fabrics was almost entirely lacking, which made a normal ceramic classification impossible. In many cases the differences between the wares are purely chronological or typological, and I am fully aware of the unsatisfactory nature of the present classification of them" (Stewart 1962, 212).

In addition to the strictly stylistic study of pottery, Stewart's classification was also criticised for being based exclusively on material coming from the cemeteries of Bellapais *Vounous* and Lapithos *Vrysi tou Barba*, both situated on the north coast, making comparisons with ceramic material coming from the south practically impossible. Overall, the weakness of Stewart's system reflects the imbalance that characterised Early and Middle Bronze Age archaeological research on Cyprus; archaeological research which was mainly concentrated on cemeteries located in the north of the island. The drawbacks of Stewart's classification system became clearer after the Turkish invasion of 1974, when the focus of archaeological research shifted to the south part of Cyprus, and new areas, which until then had remained relatively unexplored, became the new foci of study.

The pottery coming from the new sites in the south could not be readily classified using the categories suggested by Stewart, revealing a great degree of regionalism during the early stages of the Bronze Age in Cyprus. The excavators of the three most significant settlements of the EC and MC periods, Alambra *Mouttes*, Marki *Alonia* and Sotira *Kaminoudhia* (Coleman *et al.* 1996; Frankel and Webb 1996; 2006a; Swiny *et al.* 2003), expressed the difficulties that they encountered in their attempts to use Stewart's system, which turned out to have little applicability for sites beyond the modern Kyrenia district.

It should be noted that the extremely small number of excavated settlements still does not allow a thorough comparison of the EC and MC pottery coming from different regions of the island, and a complete sequence of ceramic types is still lacking. This results in our still limited understanding of the relations and potential synchronisms between the various geographical regions of Cyprus in these periods.

Despite the aforementioned limitations, ceramic research in Cyprus experienced a gradual flourishing after 1974. The new era in Cypriot ceramic studies was initiated with the publication of a revolutionary, for its time, thesis on White Painted (hereafter WP) pottery by David Frankel (1974a). Frankel, in an attempt to understand better the relationships between the different regions of the island during the Middle Bronze Age, examined the decorative patterns on WP pottery and assessed their spatial distributions using computer-based analyses. Frankel then used his analytical results to address considerations of the social dimension of Middle Bronze Age WP pottery production and distribution (Frankel 1974a; 1974b). Defining the MC stylistic WP variations associated with the localised manufacture of pottery in different parts of the island, Frankel moved a step further investigating whether regional differences could be reflected in clay composition using for the first time on ancient Cypriot ceramics the method of optical emission spectrography (Frankel *et al.* 1976).

Richard Jones' monograph on *Greek and Cypriot pottery* (1986) was a broader effort to critically review the applications of archaeological science to ancient Greek and Cypriot pottery and synthesise the results (Jones 1986, 2), making important references throughout the book to the various stages of the chaîne opératoire and the physicochemical properties of clays and how they affect these stages (e.g. drying, firing, decoration, post-burial alterations). Cypriot pottery (2500-500 BC) is discussed in this monograph in a collaborative chapter with Hector Catling (Jones 1986, 523-625). This fresh interest in the technological dimension of pottery and technical considerations beyond any simple classification of the pots can be seen in publications produced in the 1980s and 1990s (e.g. Bolger 1985; Webb 1994a).

The publication of the proceedings of the 1989 colloquium held at the University of Pennsylvania on *Cypriot Ceramics: Reading the Prehistoric Record* (Barlow, Bolger and Kling 1991) is a good indication that Cypriot ceramic studies were keeping pace with the writings of archaeologists working elsewhere in the world. Significant contributions to pottery studies, involving ethnological, theoretical, and analytical considerations such as those of Sinopoli (1988), Rice (1987), Maniatis and Tite (1981), Hodder and Orton (1976), Clarke (1968), Shepard (1956), and the collective work edited by Matson (1965), were considered by archaeologists working in Cyprus and applied to Cypriot material. These new approaches moved beyond the description and classification of specific ceramic types, to engage with issues of a more general or theoretical nature, considering topics such as the application of scientific techniques and the use of modern ethnographic studies for understanding ancient pottery production (Barlow, Bolger and Kling 1991, 4). This collective volume could be considered as the threshold to a new era in Cypriot pottery studies, where *ceramic fabric* becomes as important a ceramic variable as vessel shape and decorative style.

The ceramic studies which followed, focused on material coming from sites in the central and southern parts of the island, continued essentially to be attempts to complement Stewart's classification or suggest new alternatives. Another significant contribution in Cypriot ceramic studies was made by J. A. Barlow, who made the first substantial technological assessment of Middle Bronze Age pottery using ceramic samples from the settlement of Alambra *Mouttes*. In a series of articles, Barlow examined whether ceramic fabrics could be used to reclassify MC Red Polished and White Painted pottery and to define aspects of regional variation (Barlow 1985; Barlow 1994; Barlow 1996a; Barlow 1996b; Barlow and Idziak 1989; Barlow and Vaughan 1999; Barlow and Vaughan 1996; Barlow and Vaughan 1992). Her attempt was followed by other similar studies which combined the more traditional typological study of pottery with various other analytical methods (eg. Knapp and Cherry 1994; Summerhayes *et al*. 1996).

The main focus of these research projects was on Red Polished ware, the most abundant type of pottery throughout the Early and Middle Bronze Age. In addition to Barlow's examinations of clay types, MacLaurin Hemsley (1992) studied pottery coming from the Middle Bronze Age cemeteries of Kalavasos *Panayia Church* and *Cinema Area* for the hardness of fabrics' texture. Her visual inspection using simply a magnifying glass helped her to classify pottery according to the hardness and fineness of the fabric, making references to the inclusions' shape, size and colour, and wall thickness, and sometimes vessel shape (MacLaurin Hemsley 1992).

Whereas the main objective of the aforementioned studies, and many others, was to propose alternative ways of classifying EC and MC pottery, already at the end of the first season of their excavations at Marki *Alonia*, David Frankel and Jennifer Webb argued that the recovered ceramics could not fall in a neat, easy grouping of associated sets of variables; the ceramic assemblage could not be classified according to the quality of fabric and surface treatment. As Frankel wrote, any classification of the pottery even with the employment of pairs of variables or of more complex analyses of many variables (Frankel 1993, 65) was not desirable.

Instead of simply classifying pottery using different variables, Frankel, in a series of articles, tried to examine how these variables can provide information regarding ceramic distribution, inter-site technological relationships, the degree of uniformity or variation in ceramic production from one site to another, and ultimately the organisation of ceramic production, and the degree of social interaction in Early and Middle Bronze Age Cyprus (Frankel 1994; 1993; 1991; 1988). Moreover, together with his long-term collaborator Jennifer Webb, they provide the most detailed and systematic study of pottery published in the Cypriot archaeological literature. In their latest volume on their excavations at Marki *Alonia* (Frankel and Webb 2006a), they provide a detailed database, including every diagnostic sherd recovered, recording the type, shape, size, colour, texture, hardness, surface treatment and type of decoration.

In parallel with the new approaches to the macroscopic study of pottery, gradual but steady steps were made to integrate other scientific methods of pottery analysis to address technological and social considerations related to the production and distribution of ancient Cypriot ceramics. The initial attempts to analytically study pottery according its chemical and mineralogical composition by Courtois (1970), Wærn-Sperber (1988), Barlow and Idziak (1989), Barlow and Vaughan (1992; 1999); Cherry and Knapp (1994), Summerhayes *et al.* (1996) were followed in subsequent years by numerous others.

At present, many of the archaeological projects established on the island include in their research agendas analytical studies of ceramics, including a large range of chemical techniques such as neutron activation analysis (e.g. Gomez *et al.* 1996; Bryan *et al.*1997; Brodie 1998; Stephen 1998a) and more recently energy dispersive X-ray fluorescence (e.g. Mantzourani and Liritzis 2006; Dikomitou 2007), X-ray diffraction, and energy dispersive spectroscopy scanning electron microscopy (Tschegg *et al*. 2008), as well as optical microscopy for ceramic petrography (e.g. Weisman 1996; Xenophontos *et al.* 2000; Vaughan 2003; Dikomitou 2007).

All three major EC-MC settlement projects have employed analytical techniques for the study of a small sample of their ceramic assemblages (for Marki *Alonia* see Summerhayes *et al.* 1996; for Sotira *Kaminoudhia* see Vaughan 2003; and for Alambra *Mouttes* see Weisman 1996). Moreover, Philia ceramic types from various sites across the island (Stephen 1998a and 1998b) were analysed as part of the excavation project at the Chalcolithic settlement of Kissonerga *Mosphilia*. The overall impression produced by this small number of analytical studies is that the largest proportion of EC and MC pottery was locally made; EC and MC potters exploited local resources for the collection of raw materials, which were not processed in any complex manner before pot building and shaping. Deliberate clay mixing and tempering did not seem to be part of the production sequence, while a similar ceramic recipe was in use in different areas of the island, including Sotira *Kaminoudhia*, Episkopi *Phaneromeni*, Kalavasos *Panayia Church*, Nicosia *Ayia Paraskevi* and Alambra *Mouttes* (Barlow and Vaughan 1992; Barlow and Vaughan 1999).

Moreover, the aforementioned studies have indicated that two different kinds of clays were primarily used for the production of EC-MC RP pottery. One type originates in sedimentary soils and the other in igneous or volcanic soils (Barlow and Idziak 1989, 68). It is exactly these two types of clay that Courtois, in one of the first petrographic studies (1970), had argued to represent two different production centres. However, the more recent work of Barlow and her analytical collaborators has indicated that both types of ceramic fabric can be produced at a single production centre (Barlow and Idziak 1989; Barlow and Vaughan 1992; Barlow and Vaughan 1999).

Barlow and Idziak named these ceramic fabrics RP A and RP B. While the former seemed to be made from clay originating in sedimentary soils, RP B was made either from clays containing only volcanic inclusions or from clays containing both volcanic and sedimentary inclusions (Barlow and Idziak 1989, 68). Moreover, Barlow and Idziak have argued that this selective use of fabrics is closely related to the functional role of the pottery; RP B liquid containers were made with volcanic clays containing significant proportions of calcareous material, while totally non-calcareous RP B fabrics were used for cooking pots (Barlow and Idziak 1989, 73). On the other hand, RP A, well-levigated, wholly calcareous fabrics were extensively used for the production of incised small-sized vessels (Barlow and Idziak 1989, 74).

A preliminary overall assessment of the techniques of RP pottery manufacture at Marki was made by Webb (1994), followed by more detailed references to EC and MC pot-making technology in the subsequent Marki volumes (Frankel and Webb 1996; 2006a). The selective use of calcareous and non-calcareous clays for the production of pottery and uncomplicated processing – probably by hand-sorting – was followed by vessel hand-building, which essentially involved the techniques of pinching and coiling, depending on the individual vessel's intended size (Webb 1994, 14). Additional accessories to the vessel, such as necks, handles, spouts and lugs were formed separately and were attached to the ceramic body while leather-hard (Webb 1994, 14; see also Herscher 2003, 147).

Pot building was succeeded by drying, surface smoothing, slipping and burnishing or polishing. Especially for Red Polished ware, the latter technique was significant for the production of the red, lustrous surfaces. A small proportion of vessels were decorated with incised or impressed decoration, which was executed before firing, while the pottery was still plastic enough to be worked, and prior to slipping and burnishing (Webb 1994, 16). It was observed that decorated vessels were usually made with calcareous, fine-textured fabrics (Webb 1994, 16), an observation which reinforces Barlow's argument in relation to the selective use of clays according to the functional role of pottery (e.g. Barlow and Idziak 1989; Barlow 1996a; Barlow and Vaughan 1999). Finally, special attention was given by Webb and Frankel to the technological significance of cooking pots, as an individual category of pottery with a required degree of technological sophistication, and special properties to meet thermal shock resistance, conduction of heat, and mechanical strength (see Webb 1994, 18-19; Frankel and Webb 1996, 166-171; Frankel and Webb 2006a, 100-101, 133-137).

Bolger, among others, has indicated that earlier typologies of EC and MC wares tend to neglect technical considerations related to the manufacture of pottery (Bolger 1985, 28-29). She suggests that variations in fabric, shape and surface treatment may have occurred gradually and concurrently in different regions, or different parts of the same area (Bolger 1985, 23). Moreover, the study of the fabric compositional patterns in correlation with the typological and stylistic features of pottery can provide further information regarding raw material exploitation, patterns of production technology and exchange within the island, which in their turn could lead to interpretations regarding social structure and cultural behaviour in the EC and MC periods (Barlow and Vaughan 1992). Following these arguments, this thesis takes a similar, but broader path towards a more thorough investigation into the ceramic technology and scale of ceramic distribution during the EC and MC periods, and attempts to approach the contemporary society indirectly through a detailed technological account of the best represented category of material culture. The scientific methods used here for the study of EC and MC pottery are explained in Chapter II; what follows is the research rationale behind this project.

I.3. Setting research objectives while searching for answers. Ancient pottery as a means for technological and social investigations.

Pottery is the one artefact category recovered in abundance in every excavated site in Cyprus from the Ceramic Neolithic period onwards (*ca.* 5000-3900/3750 BC, Steel 2004, 63), often the only material category recovered. Moreover, it is the only craft that for several millennia consistently, even though at a very slow pace, evolved both technologically and typologically, and thereby tracks the evolution of Cypriot society (Merrillees 1978, 14). The importance of pottery as a source of archaeological information is particularly great for archaeologists dealing with non-literate societies, such as the one under study. Pottery was and continues to be used by people cross-culturally, regardless of their wealth or social status. In Arnold's words:

> "ceramic artefacts are thus the products of the actual behaviour of ancient peoples, and inferences of the past based on pottery can extend understanding of ancient societies beyond the verbal accounts of the learned, the wealthy, the privileged, and the influential" (Arnold 1993, 1).

In the study of the Cypriot Early and Middle Bronze Age, pottery is the only artefact type which is found in abundance in every contemporary site, providing the basis for inter-site comparisons and the development of broader island-wide arguments. Moreover, in the absence of any written or iconographical sources, and the limited settlement information, ceramics become an indispensable tool for the elucidation of a series of issues related both to the technology of their production, and the society for which they were produced and in which they were circulated, used and discarded.

According to Skibo (1999, 2), archaeologists can be schizophrenic in their methods, as these are borrowed from different disciplines, both the hard and soft sciences. Pottery can be studied with the naked eye, for the recording of typological and stylistic attributes, as seen in hand specimens, or using expensive high-tech equipment for the study of single clay particles within the pot's structure. Nonetheless, it is nowadays a common realisation that the most comprehensive studies are those which combine both macroscopic and microscopic methods, addressing a series of technological and socio-economic issues, including ceramic manufacture and distribution, fabric composition, the degree of standardisation and specialisation and the organisation of ceramic production, ceramic consumption, maintenance, and discard, even stretching to the symbolic function of pottery as a medium of social meaning. An interdisciplinary approach to the study of ceramics allows archaeologists to focus on both sides of ceramic material culture's dual nature, its physical (material) and metaphysical (cultural) existence (Skibo 1999, 2).

Matson (1965, 203) has underlined the significance of "ceramic ecology", and in particular of the raw materials and technologies that the local potter has available for pot making. Ceramic studies cannot underestimate the ecological dimension of pottery production, and fabrics must be an integral variable in ceramic analysis. Therefore one of the principal objectives of this research is to study the ceramic fabrics used for the production of various types of pots and how the properties of the various fabrics relate to the pots' functions or govern the attributes of surface finish or even decoration. In addition to the assessment of ancient technology, the study of ceramic fabrics allows the distinction between locally produced and imported products. This type of distinction, as an outcome of the compositional analysis of the clays used in a given context of pottery production, is an essential prerequisite in any technological study of ceramics, and in any attempt to understand and explain the techniques employed in pottery production, the evolution of ceramic recipes, and how the physical environment was exploited by the ancient potters.

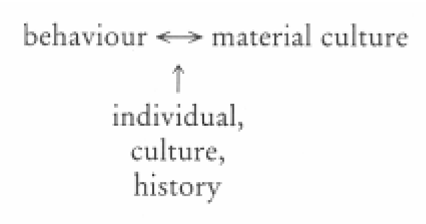

Figure I.7. "The relationship between behaviour and material culture depends on the actions of individuals within particular culture-historical contexts" (Hodder 1991, 13 and 14).

The relational schema between environment and pottery includes another, third constituent, namely culture.

> "The interrelationships of ceramics to environment and culture can be described as a channel for the flow of information between parts of the ecosystem – in this case between the environment and human beings" (Arnold 1985, 16).

In another schema, Hodder argued that cultural trends and cultural change are affected and instigated by human behaviour, material culture, the individual, and history (Hodder 1991, 14, **Figure I.7**).

In this interactive schema (**Figure I.7**), society and material culture share a two-way relationship, which is however also dependent on the actions of individual members of the society within a set cultural-historical context (Hodder 1991, 13). What both schemata imply is that human behaviour and its relation to material culture varies in time and place, and depends both on the surrounding physical environment and the existing cultural and historic context. Therefore, the study of a past society needs to take into account all the aforementioned parameters exploiting those available at the time of research, for the extraction of information and the formation of interpretational models.

Moreover, interpretational models, explaining human behaviour, are often based on ethnoarchaeological research, which is complementary to the study of ancient material culture; the former investigating patterns of archaeological interest in contemporary settings, and the latter investigating patterns within the physicochemical structure of the actual ancient ceramic products. Yet, constant communication is required between technological analyses and the discipline of anthropology for the interpretation of past human behaviours (Feinman 1989, 217-218). Otherwise, sterile scientific reports are useless, and theoretical models unaccompanied by scientific/technological justification remain general, unassesed hypotheses. Thus, a holistic approach to the study of ceramics is needed, one which considers all different aspects of pottery production, distribution, use and discard, and which does not only consider technological attributes or theoretical models to the exclusion of other factors (Feinman 1989, 219).

According to Åström, simple ethnographic studies have shown that particularly in ceramic decoration, the greater the interaction between social groups, the greater the stylistic similarity (Åström 1969, 27, see also Frankel 1974a; 1991). This argument can be further developed by arguing that in addition to the stylistic similarities, as reflected primarily in the occurrence and structure of the decorative motifs, technological similarities, such as the selection of raw materials, their processing, pot-building techniques, and firing, can also be suggestive of routes of inter-site interaction, reflecting degrees of shared traditions. This expectation, however, has an application to the extent that the aforementioned characteristics are not constrained by the properties of the locally available raw materials; as has been argued above, the surrounding environment is a significant factor constraining and affecting human behaviour and material culture.

The technological study of pottery, the distinction between local and non-local products, and the assessment of the scale of ceramic distribution can be suggestive of further particular characteristics of the society under study. These are the mode and scale of ceramic production, and moving a step further, the way in which the society was organised (e.g. Peacock 1982).

In the last couple of decades, a significant number of studies have put emphasis on the importance of investigations into the mode of ceramic production before drawing conclusions about societal organisational modes (e.g. Hagstrum 1985; Benco 1988; Costin 1991; Rice 1991; Stark 1991; Costin and Hagstrum 1995; Feinman 1999; Longacre 1999; Arnold 2000; Frankel and Webb 2001a; Roux 2003). According to Rice (1987, 180), the scale of production refers to the levels of labour and raw material resources used for the production of pottery, while the mode of production is understood in relation to how, and for whom was pottery made, as well as who made it and why. The understanding of the scale and mode of production contributes to an understanding of the economic organisation and degree of complexity of the broader society (Rice 1987, 180; also see Peacock 1982).

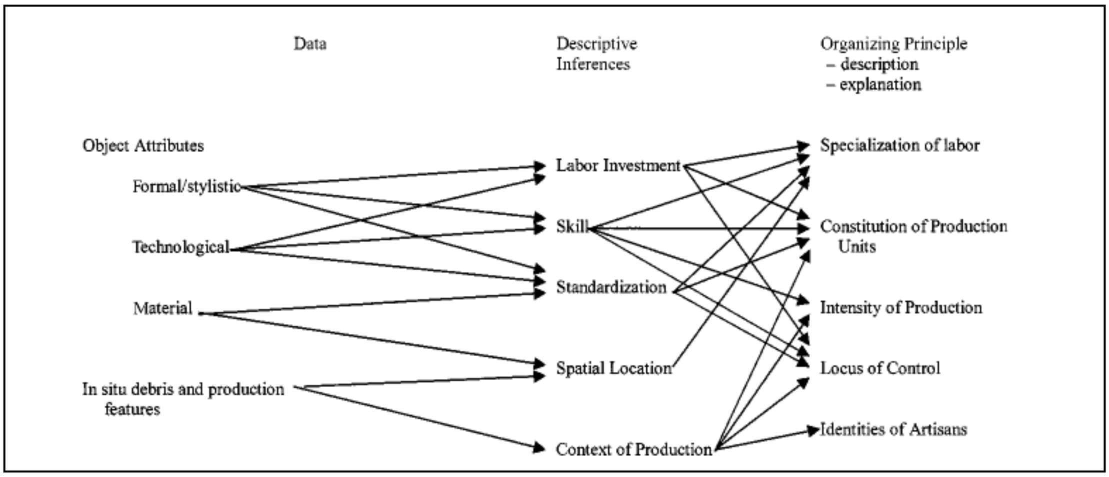

Figure I.8. Chart illustrating the flow of inference in reconstructing ancient production systems, from data to organising principles (Costin 2000, fig.1, 379).

Costin, in an often cited study, enumerates six interconnected components in the study of ceramic production: artisans, means of production (raw materials and technology), principles of spatial and social organisation, finished goods, principles and mechanisms of distribution, and consumers (Costin 2000, 377-378). These components are mutually affected by technological and organisational evolution. This interplay can be seen in **Figure I.8**, which also shows how ceramic attributes can be used to make inferences about labour investment, the artisans' skills, and the degree of standardisation and the location and context of ceramic production, for a better understanding of the degree of craft specialisation, the intensity of production, the social identity of the potters and the degree of control over resources, tools and products (see also Costin 1991).

Costin's proposed flow of inference, applicable to all societies, is significant especially in the study of archaeological contexts, such as the EC and MC ones, where relevant information is only partially, if at all, available. Moreover, the chart (**Figure I.8**) indicates that the important starting point for this kind of study is the material *per se*, namely pottery. Thus, formal/stylistic, technological, material object attributes become the core focus of the research, while considering the context of their recovery.

Furthermore, indirect approaches have been developed and applied to measure variability or standardisation in production in order to assess eventually the scale and mode of production. The term standardisation "refers to a relative degree of homogeneity or reduction in variability in the characteristics of the pottery or to the process of achieving that relative homogeneity" (Rice 1991, 268).

In other words, the craft product itself, pottery, is examined in detail and different pottery attributes are measured in order to determine the level of uniformity in ceramic production (Benco 1988, 57-58). These different pottery attributes are related to both ceramic technology and style, and include features such as size, shape, form, method of building, method of firing, wall thickness, colour, decorative methods and motifs, fabric, hardness, etc. "Standardisation, then, is a relative measure of the degree to which artefacts are made to be the same" (Eerkens and Bettinger 2001, 493).

Investigating the degree of standardisation in ceramic production, as defined by the macroscopic and microscopic characteristics of pottery, inferences can be made about the social context, the social and exchange networks and local settlements' economies and the organisation of production. Especially in the case of EC and MC society, which is best known from its cemeteries rather than its settlements, the degree of standardisation in aspects of material culture becomes an indirect way to approach social issues, and contribute to ongoing discussions about the scale of ceramic production, the networks of pottery distribution, and inter-site interaction.

Furthermore, ethnoarchaeological research and statistical analyses have enabled scholars to test their results and conclude that a series of factors, including differences in raw materials, potters' levels of expertise, market demand, manufacturing techniques, local traditions, and types of measurement can affect attempts at understanding and explaining the degree of ceramic standardisation (Roux 2003, 769). These observations take us back to the original argument that the physical and social environment, human behaviour and cultural context are equally important factors shaping material culture, and all should be studied together.

The preceding sections have presented and discussed the current state of the art regarding the archaeology of the EC and MC Bronze Age, the methodologies and approaches employed through the years and how these evolved, as well as the particular stances to the study of EC and MC pottery. After such a narrative, it is clear that the study of EC and MC culture has still a long way to go, until we reach a satisfying level of comprehension about the EC and MC people of Cyprus, with the likelihood never to fully achieve it.

Especially the absence of settlement material is a significant drawback for every scholarly enterprise, and whatever the approach employed the picture remains very partial. This is particularly evident when comparing the different parts of the island, trying to capture an island-wide picture of the social landscape.

In recent years a handful of analytical studies (Barlow and Idziak 1989; Barlow 1996b; Summerhayes *et al.* 1996; Stephen 1998a; Stephen 1998b; Vaughan 2003) have tried to approach indirectly EC and MC people and society, focusing on pottery, the predominant material category in every contemporary site. This research project was designed to complement these earlier studies employing a more systematic study of pottery, using a larger combination of analytical techniques on the largest Cypriot ceramic sample that has been until now collected for such an investigation.

Considering the settlement material available, as well as the overall conditions, advantages and drawbacks for a large-scale analytical study of EC and MC pottery, the following two case studies were developed: A) an inter-site, island-wide investigation into the typological, stylistic and technological uniformity (or variability) of RPP pottery, and B) a diachronic, technological study of the main ceramic wares at the settlement of Marki *Alonia*.

These two case studies take advantage of the currently available material dated to the EC and MC periods. The uniformity characterising the typologically and stylistically distinct RPP assemblage, which can be easily distinguished from its RP successor, allows confident inter-site synchronisms, and provides the framework for a focused technological study of the ware with specific enquiries addressed about its production and distribution during the Philia phase on an island-wide basis. On the other hand, a diachronic technological study of ceramic types, currently, can only be made at Marki, as it is the only settlement in Cyprus that has revealed a stratigraphic succession from the Philia to the MC period without a hiatus, permitting a technological assessment of pottery at the settlement, the documentation of technological variability through time, and the character of local ceramic production.

Red Polished Philia pottery from Marki and other regions of the island was sampled for the first case study, while Red Polished and Red Polished Coarse wares exclusively from Marki almost monopolised research interest in the second case study. In order to provide a more coherent picture of ceramic production and ceramic distribution at Marki, other types of ceramic artefacts of probable local provenance, such as fragments of hobs, loomweights and mealing bins, were also included in the sample. In addition, an apparently imported ware, namely Early Red Slip, was sampled to provide a contrast to local manufacture. For a more complete picture of ceramic production and distribution at Marki, from its foundation in the Philia phase until its abandonment in MC II, Philia cooking pot samples were also selected for a technological comparison with Early and Middle Cypriot cooking pots. White Painted Philia and Philia Red Slip completed the Philia sample providing a broad picture of ceramic production and distribution at Marki during the Philia phase.

This is a large-scale, multi-dimensional project using an integrative combination of scientific techniques for the physicochemical analysis and compositional characterisation of nearly three hundred samples. The employment of more than one technique offered the opportunity to test the validity of separate analytical datasets and compare and evaluate the results of each individual analytical method. Moreover, the study of a large sample permitted the examination of earlier observed patterns of ceramic technology, the assessment of their relevance to a larger number of specimens, as well as the documentation of how these patterns evolved within the EC and MC periods.

Table I.3 presents the main research enquiries addressed in the framework of this thesis. As shown, research questions are addressed at two different levels. The first one involves the reconstruction of production and distribution during the Philia, EC and MC periods, whereas at a second stage, accumulated information regarding production and distribution are used to define the mode of social interaction during these periods in the course of an assessment of the technological similarity or variability among the samples under study.

A. Reconstruction of production and distribution
1.1 Composition (raw materials, fabrics)
1.2 Surface treatment
1.3 Firing
B. Social interaction during the Philia, EC and MC period
1.1 Recording of inter-site and intra-site variability
1.2 Local versus imported materials (when possible)
1.3 Assessment of scale of ceramic distribution and social interaction

Table I.3. This thesis' research questions.

In this research, ceramic technology is a key field of investigation. It should be noted that the term "technology" encompasses the *process* of production, that means the materials and techniques (Hodges 1989) used for crafting artefacts, as well as their actual manipulation, their function and scale of distribution, and the human knowledge involved in their entire life cycle (Lemonnier 1993; Skibo 1999). In this way production is placed in a social setting (Miller 2009, 3), and technology and material culture are used to develop linkages between "the surviving things and past people" (Miller 2009, 6), and ultimately elucidate the picture of EC and MC societies, their organisation and practices.

Throughout this study an attempt is made to develop a discussion synthesising the available archaeological, petrographic, chemical, and other analytical data. To orientate the reader, this introduction into the current state of the art relating to the archaeology of the EC and MC periods, and the rationale behind the design and execution of this research, is followed by Chapter II, which defines the sampling strategy and the methodology employed for the implementation of the project. The macroscopic study of the samples collected and the results of the analyses conducted in the framework of the two case studies are presented and discussed in Chapters III and IV respectively, while the overall outcomes of the entire thesis are discussed in the concluding Chapter V.

CHAPTER II

SAMPLING AND METHODS OF ANALYSIS

II.1. Sampling approach: The collection of ceramic and soil samples.

As was briefly explained in the preceding chapter, in the first case study of this research, an inter-site, island-wide investigation into ceramic traditions, technological and social interchange was focused on RPP pottery. This monochrome ware, predominant during the Philia phase, conforms to a restricted typological and stylistic repertoire, presenting a notable homogeneity across the island, easily distinguished from the ensuing RP pottery (Webb and Frankel 1999). The distinctive character of RPP pottery allows the confident dating of the sites of recovery and enables inter-site synchronisms, the two most important preconditions for this kind of investigation.

The samples for the study of RPP pottery across Cyprus were collected according to the typological characteristics of the ware defined by Webb and Frankel (1999). They represent all the different regions of the island where Philia material has been found (Georgiou 2006), and include both large- and small-sized vessels, as well as open and closed shapes. Unfortunately, due to the small size of the RPP assemblages at each site, permission was not given to collect more than six specimens from each site with the exception of the sites of Philia *Laksia tou Kasinou* and Marki *Alonia*, the larger assemblages of which allowed the selection of a larger number of samples.

For the second case study, an attempt to reconstruct production and distribution at Marki, the selected samples represent the main wares from this single site assemblage, and document any potential technological differences or changes in each of these wares over time. In the case of Marki *Alonia*, which includes the study of more than one ware, sampling was focused on the proportional representation of the main ceramic wares, without trying to include the more exotic and rarer wares found at the site. Given the practical constraints on the number of samples which could be analysed in the project, the objective was a robust study of the principal wares produced at Marki *Alonia*, which could not afford to include minor wares, most or all of which were likely to be imports and so represent products of other local traditions. For this reason, wares such as Black Polished, White Painted and Drab

Polished, which are present at the settlement in small quantities, were excluded from sampling.

For sampling the Marki assemblage, chronological, contextual and typological dimensions were considered, so that the sample was systematically representative of an extended area of the settlement through time. This design was especially applied for the major categories of RP and cooking pots. The sample from Marki essentially represents all the occupational strata of the settlement from the Philia phase until the MC II period when the settlement is gradually abandoned (*ca*. 2400-1700 BC). Of special interest were samples coming from compounds 6 and 7, which remained in use between occupation phases C to G (Frankel and Webb 2006b), from the EC I to MC I periods (*ca*. 2300-2000 BC). However, as new compounds were established in the successive occupational periods, in an expansion of the settlement, samples from other household units, representing all the different chronological phases and areas of the settlement were also collected.

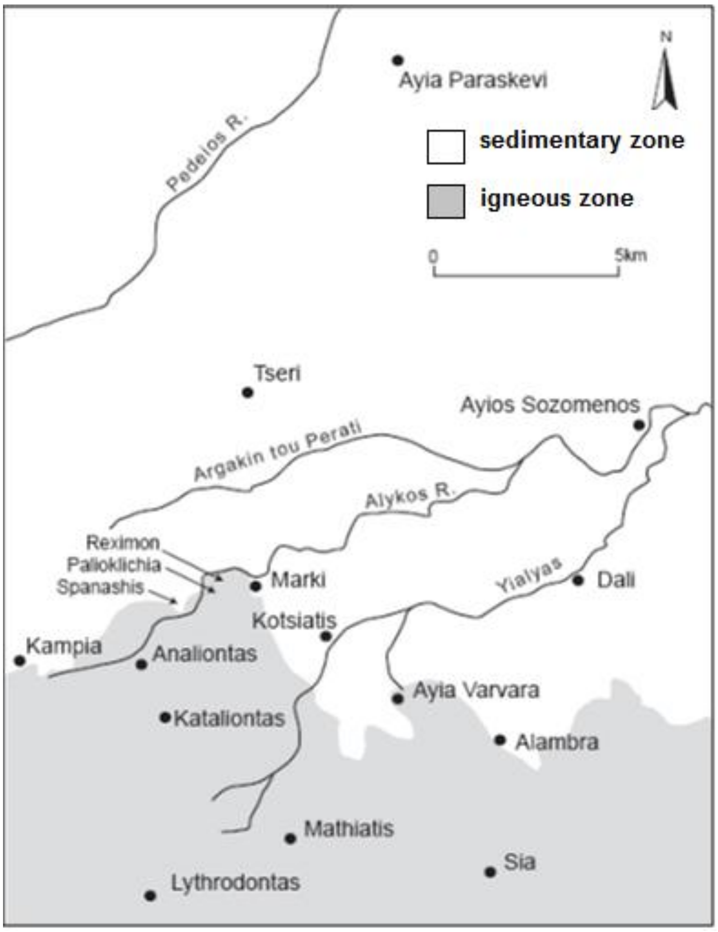

Figure II.1. Marki *Alonia* in its regional setting (by Frankel and Webb 2006a, text figure 11.2, 307).

It should also be stated that during sampling, earlier hypotheses based on the macroscopic study of the Marki ceramic assemblage expressed in various articles and the two volumes dedicated to the site were considered. Thus, in addition to the temporal and spatial dimensions, internal typological subdivisions within the RP and cooking pot assemblages were also taken into consideration for the testing of these hypotheses, and their validation or rejection according to the new analytical data.

Finally, in addition to the ceramic samples, soil samples were also collected from the vicinity of Marki *Alonia* and up to approximately five kilometres around the settlement, towards Analiontas, Kotsiatis, the Mathiatis mine, Agia Varvara and Sia (**Figure II.1**). The samples represent the igneous deposits of the Troodos mountain foothills, the alluvial deposits around the Alykos River and the sedimentary deposits towards the Mesaoria plain. This was done in order to assess the degree of mineralogical similarity between the ceramic samples from Marki and the adjacent geology and provide justification in the attempt to distinguish between local and non-local pottery.

The locations sampled were recorded using GPS equipment. A macroscopic description of the soil samples (**Appendix I**) was provided by a professional geologist, Dr George Petrides, before they were mixed with water and formed into briquettes. With the exception of large inclusions, which were removed by hand, any sort of clay processing was avoided. The briquettes were fired in a furnace to 750° C. The total duration of firing was five hours, with the firing temperature remaining stable at 750°C for the last two hours of firing. After firing the briquettes were left to cool and were cut into sections using an electric saw. The cut sections were sent together with the ceramic samples to the laboratories of the Universities of Oxford and Royal Holloway to be prepared into thin sections.

II.2. Cutting across disciplines. A definition of research methods.

A significant contribution of pottery studies is documenting ceramic and thus cultural variation in time and space. Differences can be observed in the raw materials exploited for the production of pottery, the preparation of the fabric, the techniques used for the building of the pots, size, shape, surface treatment, firing, and other characteristics, all of which form part of ancient ceramic traditions.

These typological, stylistic and technological differences are the main criteria for the categorisation of pottery into classes. It can be debated whether ceramic classifications are relevant to ancient societies or whether they are purely modern archaeological constructs (Sinopoli 1991, 4). However, ceramic classification remains the principal approach to the study of pottery, as taxonomies allow researchers to organise the material under study in meaningful ways, in order to identify patterns in the data.

The most common way to categorise pottery is primarily based on technological attributes and morphological types; extra attention is given to the shape, size and surface treatment. As has been already explained in the preceding chapter, in the case of Cypriot prehistoric pottery, even ceramic nomenclature is based on the most obvious technological characteristic of each type of pottery, this often being related to the external surface treatment. The long ceramic sequences organised and published by scholars such as Åström (1957), Dikaios (1962) and Stewart (1962) still remain the foundations of chronological and regional analyses.

The categorisation of pottery into classes based on the typological and stylistic similarities (or variation) of the individual specimens of an assemblage is an essential approach to the study of ancient ceramics. As has been already discussed in Chapter I, whereas in early studies, this approach was essentially descriptive, and focused on the establishment of temporal sequences, with time artefactual variability considered to be synonymous with cultural variability, and pottery started to be used as a means to investigate into cultural change.

An important first step is the precise and accurate description of ceramic attributes, including those traditionally studied in typological and stylistic analyses, as well as those which “go beyond the eyeball” (Plog and Steadman 1989, 208), and the recording of which can only be done with the employment of instrumental analytical techniques. Thus, at the very beginning of the project, tables were created for all samples collected and information regarding their macroscopic attributes was inserted[20].

In addition to a photograph illustrating each sample, information was collected about the context of its discovery, shape, degree of preservation, decoration and surface treatment on both exterior and interior surfaces, degree of oxidation, fabric and hardness and wall thickness (**Appendices III.1 and IV.2**). The macroscopic description of the samples was useful not only for reference purposes, but also for

[20] Macroscopic descriptions of the samples from the Marki ceramic assemblage were given by Frankel and Webb (2006a).

technological investigations, related to the techniques and stages of manufacture, inter-site comparisons in the case of the RPP pottery and inter-phase comparisons in the case of the Marki ceramic sample, for temporal, spatial and behavioural discussions.

In addition to the aforementioned macroscopic characteristics of the samples, information was collected about their microscopic characteristics, in relation to the samples' microstructure, and their compositional characteristics. As argued by Rice:

> "Of all the materials and processes involved in making a pottery bowl or jar or dish, the most important are clay and its manipulation. Hence a discussion of pottery making must begin with the raw materials: with clays and their origin, composition and properties" (Rice 1987, 31).

Moreover, according to Shepard's (1956, xi) pioneer work:

> "it is clear that chemical and mineralogical analyses both have their particularly appropriate applications in ceramic studies, and in many phases of investigation they supplement or complement each other. The great advantages of mineralogical analysis are that it defines the potters' materials, affords a direct guide for locations of centres of production, and can be used effectively for samples of sufficient size for statistical analysis".

Therefore, **petrography** was used for the mineralogical characterisation of the ceramic samples, and the study of their micro-morphological characteristics that could lead to information regarding the technology of their manufacture and their provenance. Cross sections were detached from the ceramic sherds and were sent to external laboratories to be prepared into thin sections, the average thickness of which does not exceed 30 microns. The thin sections were then studied with the petrological microscope, which has the ability to view inclusions under different optical conditions, in this case with the aid of polarised transmitted light (Jones 1986, 54).

Through petrography, the inclusions in each thin section were identified and therefore the mineralogical composition of each sample was determined. Information was recorded on the shape, texture and degree of sorting of the mineral and rock material, and references were made to the grain size, shape, and distribution (Jones 1986, 54). The recording system used was the one proposed by Ian Whitbread (1995), and which has already been successfully used for the implementation of a previous study on MC RP pottery (Dikomitou 2007). At this point, it should be emphasised that studies of ancient Cypriot ceramics, regardless of the time period in which they belong, need to adopt a methodical system of description, so that inter-project comparisons can be feasible. Whitbread's descriptive system is simple in practice, and at the same time, it can provide all the necessary information for the identification of fabrics amongst ceramic assemblages from different localities.

The recording of petrographic information (**Appendices III.2 and IV.3**) includes descriptions of the microstructure, groundmass, matrix, inclusions in coarse and fine fraction, amorphous and textural concentration features (acfs and tcfs); all terms were used as defined by Whitbread (1995). In addition to the mineralogical descriptions, photomicrographs in plane- and crossed-polarised transmitted light (PPL and XP respectively) were taken for the visual representation of fabrics making them easier to compare.

Special reference should be made to the term fabric, which represents one of the most important aspects of this thesis. In the context of the petrographic descriptions in this study and according to the definition provided by Whitbread (1995, 368), the term fabric "refers to the arrangement, size, shape, frequency and composition of components of the ceramic material". However, in the broader context of the thesis, the term incorporates the mineralogical and chemical characteristics of each sample, as well as any characteristics related to each sample's microstructure, as defined by the various analytical methods. The term is therefore entirely technical and it is restricted to describing micromorphology and composition (Whitbread 1995, 368).

In the process of fabric groups definition there was an attempt to identify "core clusters" of sherds which were either identical, or very similar but not quite identical (Plog and Steadman 1989, 211). Given that clays occurring from a single source can differ in some inclusions, especially if they have derived from alluvial deposits, mineralogical fabric groups were defined according to the presence or absence of plastic and aplastic constituents in the clay matrix of each sample, their density and mode of distribution. Samples which could not be allocated to any of the defined fabric groups were identified as outliers.

The division of samples into fabric groups, and the recording of any information visible in thin section regarding the various stages of each fabric's manufacture provided the basis for the reconstruction of Marki's local ceramic traditions and how they evolved from the EC to MC periods, as well as the degree of variation within the RPP tradition across Cyprus. The petrographic data were considered in juxtaposition with the macroscopic information, in order to understand and explain the functional factors guiding the ancient potters' technological choices.

In other words, mineralogical analysis was used to assess the coherence of established typological groupings, and provided additional information to technologically explain these typological and/or functional groupings, and in which ways they are meaningful. This kind of work, therefore, moves beyond stylistic *objet d' art* descriptions and offers a basis for defining and explaining ceramic typologies related to technological, temporal and spatial information.

As Rice argues, petrography possesses a degree of subjectivity (Rice 1987, 309), as a great portion of the recorded information is subject to the petrographer's personal experience. The allotment of samples into fabric groups is not always a straightforward process, and good knowledge of the mineral and rock inclusions' characteristics, as well as attention to their density, size and sorting is also required.

In order to provide independent data to confirm and refine the interpretation of the petrographic data, **energy dispersive X-ray fluorescence** (hereafter ED-XRF) was used as a complementary method of analysis, in order to evaluate the correspondence between the mineralogical and chemical groupings and define their degree of consistency. ED-XRF analysis was employed for the bulk elemental analysis of the ceramic samples (**Appendices III.3** and **IV.4**). The main advantages of the method are its ability to analyse a relatively large number of samples, which can be prepared cost-effectively in a relatively short period of time. It should be emphasised that ED-XRF can detect and quantify a large proportion of the periodic table – from sodium (Na) to uranium (U) – and can quantify both high and very low (to a few parts per million – ppm) concentrations.

The samples were prepared as pressed-powder pellets. The preparation procedure included the extraction of a section of around six grams (6g) from each sherd using an electric saw, the removal of any surface alterations and coatings from the inner and outer surfaces using standard grinding paper, followed by washing with water and drying. Each sample was then crushed manually before being channelled into an agate planetary ball mill to be ground into fine powder.

The fine powder was then placed into vials and left to oven-dry at 100º C overnight. After complete drying, each sample was mixed with a binding substance (wax) using an agate mortar and pestle set. The weight ratio of wax to sample used was 0.1125:1. The mixture was then placed in aluminium cups and pelletised using a hydraulic press. ED-XRF analyses were carried with a Spectro X-Lab 2000 using Spectro's "turboquant" evaluation method, which employs three secondary targets and is optimised for the analysis of soils.

In addition to the pressed powder pellets, primary standards (Pollard *et al.* 2007, 307) were also analysed as reference materials in order to test the accuracy and the precision of the analytical dataset (see below). The standard samples analysed are ceramic SARM 69 SACCRM, basalt Hawaiian volcanic USGS BHVO-2, firebrick ECRM 776-1, and brick clay NBS 679. Moreover, each set of samples and reference materials were reanalysed during a single run of the instrument as well as between runs over longer periods of time, in order to measure precision and assess any potential analytical drift (Pollard *et al.* 2007, 309) in the ED-XRF analyses (see below).

Further processing of the analytical dataset before any statistical manipulation includes the conversion of all elements into oxide compounds by stoichiometry. It is worth noting that the samples characterised by the larger concentrations in calcium oxide (CaO) were also characterised by the lower values of analytical totals[21]. This lower analytical total for calcareous fabrics is related to their carbonaceous nature and the inability of the ED-XRF method to detect elements having an atomic number lower than sodium, such as carbon[22]. In order to facilitate comparisons, all analytical data were normalised to 100%. Nevertheless, analytical totals are given in all the tables.

In addition to the images taken using optical microscopy, **scanning electron microscopy (**hereafter SEM**)** was used for the acquisition of high magnification images (with magnification up to 3500X) in both the secondary and backscattered electron modes, to observe samples' micro-morphologies, relief and internal compositional variation, respectively. The higher magnifications in secondary electron mode are especially useful to study the structure of individual clay particles and their degree of vitrification, which can be used as an indicator for firing temperatures (Maniatis and Tite 1981). All of the high magnification, secondary electron images were taken using an accelerating voltage of 20 kV.

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[21] Analytical total is determined as the sum of concentrations of all measured elements in the composition of a sample. It is expressed in weight percent (wt %).

[22] For quantitative comparisons between calcium oxides and carbon in the concentration of Red Polished samples see Dikomitou 2007.

An **Oxford** Instruments **energy dispersive x-ray spectroscopy** system attached to the SEM (hereafter SEM-EDS) was also used for the chemical characterisation of ceramic slips (**Appendices III.4** and **IV.5**), separately from the main ceramic matrices. SEM-EDS has the advantage over other analytical techniques to acquire and generate high magnification images of the analysed areas, and provides to the user the facility to select the desired area for analysis, in this case the slip layer.

Prior to analysis, the samples were prepared as polished cross-sections set in a mixture of resin and hardener. The analysed area was polished using a series of polishing papers, progressively moving from the roughest to finest grit paper, while water was constantly added as a lubricant. Once the finest paper was used, polishing pads on wheels were used together with a diamond paste of 1 micron finish and an assorting lubricant during the final polishing stage. The polished sections were then cleaned and dried thoroughly before being carbon-coated. Carbon-coating is used prior to observations in the SEM-EDS to prevent charging and sometimes to increase the emission of secondary electrons. It should be stated that carbon does not normally interfere in the elemental characterisation of the specimens.[23]

The data were processed using Inca microanalysis software, following a standard procedure to combine elements with oxygen by stoichiometry, like in the case of the ED-XRF dataset. Due to the initial carbon coating of the ceramic specimens as part of the sample preparation procedure, carbon was excluded from all analyses. The equipment was calibrated with cobalt standards. Acceleration and process time (pulse processor) were systematically set to 20 kV and 5 seconds per datum.

It is important to determine both the accuracy and the precision of the analytical datasets before embarking on statistical and interpretational investigations. Precision reflects the degree of reproducibility of the analytical dataset, and is assessed by repeatedly analysing the same reference samples and calculating the coefficient of variation for the analysed values for each element. Several factors can affect precision adversely, such as changes in the sample preparation or analytical set up. Moreover, good precision is essential to ensure consistency within the dataset, so

[23] All information regarding polished section preparation was collected from Oxford Instruments, 1997. *The principles and practice of X-ray microanalysis. A UK introduction to microanalysis,* volume 1. Oxford: Link Isis operation.

that data for samples analysed in different analytical sessions can be pooled and treated together (Pollard *et al.* 2007, 313).

Accuracy indicates the degree of closeness between the analysed values and the actual (true) values. This is assessed by analysing reference materials of known compositions, and comparing the analysed values to the real reference values (Pollard *et al.* 2007, 313). Even when an instrument is precise and well calibrated, accuracy can be affected by a variety of factors, such as the detectors' variable sensitivity for different elements, and sample matrix and mineralogy effects such as absorption, fluorescence or diffraction. However, it is important to monitor and report accuracy with a view to eliminate elements with low accuracy from further statistical treatment or interpretation, and also to facilitate comparison between different instruments whose analytical errors may not be the same. Accuracy and precision ultimately show the degree of confidence with which the dataset can be used and further manipulated.

All the sample batches analysed during this project were run together with reference materials in order to monitor both precision and accuracy. Detailed results for these tests are presented in **Appendix II**. In general, precision values were found to be very good, with coefficients of variation (hereafter CV) typically remaining lower than 10% for all major, minor and trace element oxides, and often much lower. Only the CVs for soda were found to be substantially higher - as typical for this type of equipment, given its lower sensitivity for lighter elements.

Accuracy tests showed a tendency for alumina values to be overestimated, generally balanced by slight underestimations of potash, lime and titania. These aspects should be borne in mind if the present dataset is to be compared or integrated with data from other instruments. The accuracy for soda values was also found to be poor, as well as the analysed values for cobalt oxide, which appeared much higher than in the reference compositions. Based on the above, neither soda nor cobalt oxide were considered further in the ED-XRF data processing.

BHVO Basalt Hawaiian Volcanic standard reference material was used to evaluate the accuracy and the precision of the values collected by SEM-EDS (**Appendix II.3**). The SEM-EDS precision values were also found to be really good, with the CV for all measured element compounds remaining below the upper limit of 10%. The good precision values indicate that internal variation within this dataset can be measured and explained with confidence. However, some caution should be exercised when comparing the SEM-EDS dataset with other data. Most elemental values oscillate in the acceptable range of 10%, but underestimation is observed in relation to iron oxide and overestimation in relation to the values of potash. As expected, soda was again found overly estimated due to sensitivity of the machinery for light elements, and should not be included in any of the statistical analyses.

It should also be stated that all the trace elements characterised by elemental concentration below 10 ppm were removed from the datasets prior to statistical processing. In addition, sulphur trioxide (SO_3) and cerium oxide (CeO_2) were not included in the statistical manipulation as their concentrations in many of the analysed samples were indicated to be below the detection limits of the ED-XRF instrument. Chlorine (ClO) was another element to be omitted from further processing as the concentration of this element in the composition of the samples could be distorted by its presence in the wax that was used as the binding substance during pressed-powder pellet making. Sodium oxide, phosphorus pentoxide, sulphur trioxide, cobalt and cerium oxides (Na_2O, P_2O_5, SO_3, Co_3O_4, CeO_2) were omitted from multivariate statistics because of their inconsistent values and poor reproducibility in successive analytical runs. It should also be stated that lead oxide (PbO) was removed during the statistical manipulation of the dataset deriving from the ED-XRF analysis of the samples coming from Marki, as this also produced values below the detection limit of the instrument (**Appendix IV.4.a**).

Statistical analyses, and in particular classificatory and reduction statistical techniques, were used to further manipulate the analytical dataset, in order to identify groupings among the compositional data, and display in graphical representations any relationships between the chemical compositions of the samples, chronology, specific wares or site origin. Moreover, the statistical analyses formed part of an assessment of the extent to which discrimination of groupings within the data is possible and which of the variables are the best discriminators (Knapp and Cherry 1994, 8).

Both **hierarchical clustering analysis** and **principal components analysis** (hereafter PCA) were employed. The former method was applied using the Minitab statistical package in order to measure similarity (or distance) between the samples based on their chemical compositions. The relationships between samples and groups of samples were represented in the form of dendrograms. The linkage method used was Ward's method, which has been widely used in archaeology, especially for analysing continuous numeric data, such as compositional datasets (Shennan 1997, 241). Distance was measured using the Squared Euclidean method, which is thought to work best in conjunction with Ward's method[24]. Finally all variables were standardised so that equal weight could apply to all variables regardless of their relative abundance (Shennan 1997, 115). This further means that equal weight was applied during analysis to both major and trace elements for a more comprehensive contribution of all chemical constituents in defining fabric variation.

PCA, the second multivariate method used and applied using the SPSS 14 statistical package, has the ability to summarise the full set of variables by a smaller number of compound variables (Shennan 1997, 269). The new variables are determined by PCA on the basis of the correlations among the original variables and "can be seen in some sense as the average of a group of variables" (Shennan 1997, 270). The greatest advantage of PCA is that it reduces the complexity of the dataset to a smaller number of independent variables, which can then be analysed or visualised more readily, for example through scattergrams, which can be used to determine whether there are any trends or groupings within the data (Shennan 1997, 267). Moreover, the component plots provided by PCA are graphic representations of the main elements determining group structure, and visually illustrate the basis on which the various chemical clusters differ.

II.3. Research objectives meet research methods.

Technology was the key dimension under investigation in this project. Both human and social evolution is directly entwined with the materials that were accessible at any given time and place and which had the appropriate properties to lend themselves to making artefacts and serving functions (Knapp and Cherry 1994, 25). "Materials, in other words, are one of the primary resources of humankind, and the study of materials reveals the close interdependence between the natural and the social" (Knapp and Cherry 1994, 25).

In particular, the study of material technology, in this case pottery technology, examines the relation of material properties (e.g. ceramic composition, hardness, plasticity) to human behaviour and decision making (Rice 1987, 310) and how these change in time and space. The three methods of analysis selected, namely petrography, ED-XRF and SEM-EDS, were employed for the determination of the technological properties of the pottery wares and types under study, meaning the

[24] Information from Minitab version 15 Statistical software help tips.

physical, mineralogical and chemical characteristics of the samples. This information in combination with the macroscopic data was used to define specific ceramic traditions, and how they vary, in the first case study across the island, and in the second case in a single long-lived settlement tracing technological changes through time.

In the first case study, the mineralogical and chemical information gathered was used to differentiate and compare ceramic fabrics in terms of their raw materials and methods of preparation. This technological information was used to assess the actual range of variation in the RPP assemblage coming from different sites, with the ultimate aim to address the social and economic context of RPP production, and the nature of material exchange and social interaction during the Philia phase (Chapter III).

In the second case study, the technological information was used to determine the local ceramic traditions at a single settlement of the Early and Middle Cypriot Bronze Age, through the analytical study of the typical wares at the settlement. The longevity of Marki *Alonia* allowed the recording of technological changes within the approximately seven hundred years of the settlement's lifespan. Furthermore, the technological variability within the Marki ceramic dataset was used as an index of the degree of material exchange and intra- and inter-community social relations (Chapter IV).

For addressing all the aforementioned issues, a basic precondition was the distinction between local and imported products, at Marki and the other Philia sites. In terms of ceramic provenance, there are two basic assumptions when physicochemical methods are employed for the study of ancient pottery. Firstly, ceramics coming from different regions differ in their chemical composition, and variation between sources is larger than within sources. These chemical differences could be associated either with the place of manufacture through the use of local resources, or the techniques employed for pottery making which select and transform the basic raw materials (Brodie 1998, 11). The second assumption is that the fabric groups showing the highest frequency at a site are assumed to be local products, and therefore, the corresponding major chemical cluster at the site can be identified as representing the local products (Brodie 1998, 12). In order to test the validity of these assumptions, the combination of independent data from different analyses was crucial, as was an overall assessment of the island's geology.

The combination of petrography and chemical methods of analysis was extremely beneficial to the success of the project. On the one hand, petrography enabled the technological and mineralogical characterisation of all the samples, and allowed direct comparisons with the collected fired soil samples collected from the vicinity of Marki. Complementing petrography, SEM high-resolution imagery provided additional information related to ceramic microstructure, adding to knowledge about techniques in ceramic production. Moreover SEM-EDS analysis of the ceramic slip layers contributed to extra informat ion on clay selection and processing. Finally ED-XRF was used to assess the fabric variability as understood with the employment of petrography, and together with petrography was used as a basis to assess and explain typological and technological distinctions.

By the end of the research, a significant volume of technological information was used to explore a series of other interrelated issues. In Chapter V, an enquiry is made into the degree of standardisation in local ceramic traditions and how this can be used to make inferences about the mode of ceramic production. Ceramic standardisation was measured according to the degree of macroscopic and microscopic ceramic attribute variability within the defined fabric groups. Employing Costin's (2000) flow of inference in reconstructing ancient production systems (see Chapter I, **Figure I.3**); further inferences were made about the organisation of ceramic production and the presence of and the distinction between local and regional production centres.

This distinction is important for the reconstruction of the mode of material and social exchanges, and how they can be understood on two different scales, from an island-wide perspective during the Philia phase, and in relation to a single settlement from the Philia to the MC periods. Overall, the substantial body of new data generated for this research can substantiate discussions about social interaction from Philia to the MC period, and the related phenomenon of regionalism and how this evolved during the earliest periods of the Cypriot Bronze Age.

CHAPTER III

AN ANALYTICAL INVESTIGATION INTO THE PHILIA PHASE. AN INQUIRY INTO CERAMIC UNIFORMITY IN CYPRUS, CA. 2500-2300 B.C

III.1. RPP ware under the microscope. Research objectives

RPP is the predominant type of pottery during the Philia phase and the antecedent of RP ware, which replaces RPP as the most abundant class of pottery during the ensuing EC and MC periods. It should be noted that RPP is a very distinct type of pottery, easily distinguished from its RP successor by reference to shape, fabric, and surface treatment. The typological, stylistic and fabric distinctiveness of RPP is seen in the highly lustrous red surfaces, the regular presence of burnishing marks, the restricted number of shapes such as small to medium sized flat-based hemispherical bowls, cut-away flat-based ovoid-bodied jugs and juglets, deep tubular-spouted bowls, as well as flasks and amphorae (for full account of RPP shapes see Webb and Frankel 1999, 15-16; Frankel and Webb 2006a, 92-98), and soft fabrics, characterised by the distinct presence of grey inclusions (below shown to be primarily micritic limestone) and small voids.

In addition to the red monochrome evenly burnished undecorated vessels and the evenly burnished with incised and/or relief decoration vessels, the term RPP is used to refer to a number of other sub-varieties including irregularly burnished (or stroke burnished) vessels, band-burnished vessels, and differentially fired vessels. Even though these sub-varieties result from differing firing and/or surface treatment techniques employed in their production, a "lumping" rather than a "splitting" approach is applied by archaeologists, who use the term RPP indiscriminately for all the different sub-varieties (Bolger 1991, 30; Peltenburg *et al.* 1998, 94; Webb and Frankel 1999, 14). The main reason for applying such a broad, unifying term to a number of different sub-varieties of the ware is the aforementioned distinct shape and fabric homogeneity that characterises these vessels, even if coming from different regions of the island (Bolger 1991, 33-34; Webb and Frankel 1999 16-17; Frankel and Webb 2006a, 92).

This island-wide homogeneity of the RPP assemblage prompted Manning to ascribe the ware to "specialised production associated with the emergent elite" (Manning 1993, 48). According to this scholar, "the marked uniformity of fabric […] reflects the rise of one dominant specialist production centre exporting all over the island or the spread of a specialist type and technology across the island as a valued prestige assemblage" (Manning 1993, 48; also Manning and Swiny 1994, 166). A similar argument was put forward by Swiny, according to whom "such a lack of pronounced regionalism would suggest a degree of craft specialisation and standardisation caused by the presence of a central authority" (Swiny 1989, 18).

However, unpublished petrographic data[25] from Kissonerga *Mosphilia* (Robertson 1989), electron microprobe analysis on samples from Marki (Summerhayes *et al.* 1996), and petrographic and instrumental neutron activation analysis (INAA) on samples coming from various sites including Kissonerga *Mosphilia*, Khrysiliou *Ammos*, Philia *Vasiliko*, Vasilia *Evrima* and Sotira *Kaminoudhia* (Stephen 1998a, 141-144) indicated chemical differentiation among samples from different sites, and suggested local manufacture (Summerhayes *et al.* 1996; Robertson 1989) or at least multi-centric production of RPP pottery (Stephen 1998a and 1998b).

Furthermore, Webb and Frankel argue that RPP at Marki is found among a range of materials that represent all aspects of domestic discard and cannot be seen "as a socioeconomic overlay imposed by elites" (Webb and Frankel 1999, 17). For Frankel and Webb, the RPP typological and stylistic uniformity, in contrast to the marked regional tendencies observed in chronologically earlier or later wares, is perceived as part of a series of behavioural and identity markers distinguishing a new migrant group to the island from the indigenous Chalcolithic communities.

Moreover, in an attempt to examine the means of maintaining the cultural uniformity in the Philia phase, it has been recently argued that communal events, particularly in mortuary ritual, played a significant role (Webb and Frankel 2008). Whereas the predominant presence of pouring and drinking vessels in the Philia ceramic record has been interpreted by some scholars to form part of drinking activities, restricted to the privileged elites (Manning 1993, 45; Peltenburg 1996, 23), Webb and Frankel perceive these ceramic shapes as part of a shared mentality for communal consumption events; and as the larger quantities of these shapes were found in funerary contexts, it was argued that these communal events were associated with mortuary rituals (Webb and Frankel 2008).

[25] By courtesy of Prof. A.H.F Robertson, School of Geosciences, University of Edinburgh and the Lemba Archaeological Project, Paphos, Cyprus.

Supporting their earlier arguments, Webb and Frankel view this homogeneity in the ceramic repertoire, found in the Philia tombs, as contradictory to assumptions related to social competition and display. According to Webb and Frankel:

> "the similarity of vessel form and decoration across the island suggests that commensality and the equipment used in communal events were vehicles of horizontal integration rather than vertical differentiation within and between Philia communities" (Webb and Frankel 2008, 289).

Even if earlier petrographic and chemical studies explored issues related to the provenance of the RPP fabrics, they failed to address issues of equal importance, related to the technology of their production and the degree of variability within individual site-traditions. There is a total lack of information regarding the technology used in the production of the Philia pottery and all evidence used to support the argument for great uniformity within the RPP assemblage on an island-wide basis derives exclusively from macroscopic studies. Moreover, previous petrographic and chemical data derive from small samples, which cannot be considered representative or sustain broader, inter-site, comparative arguments. Finally, the use of only one analytical method in each of the earlier studies prevented researchers from comparing datasets deriving from different techniques and testing their correspondence, interoperability, and consequently their validity.

There is hence a need to readdress the RPP pottery's morphological uniformity (or variability) on strictly technological terms and define the exact technological similarities or differences between individual vessels. This technological assessment is an essential prerequisite in assessing, validating and explaining the degree of uniformity or variation of the Philia pottery. At the same time, it is also an attempt to approach the ancient potters from an entirely different angle, and explore their technical choices through the various technological features of Philia pottery. Finally, emphasis is given to establishing a broad understanding of RPP pottery traditions in this earliest stage of the Bronze Age, and comparing them with those of subsequent periods, in particular the ensuing RP, for an assessment of the evolution of the craft during the EC and MC periods.

In their 1999 publication *Characterising the Philia phase*, Webb and Frankel provided a gazetteer of Philia sites, recording all sites where Philia material has been found. Using this gazetteer as a guide, eight Philia sites were selected for the collection of RPP samples, representing the main regions of the island where Philia material has been recorded. The sites studied are Vasilia *Kylistra* on the north coast, Kyra *Alonia*, Philia *Vasiliko* and *Laksia tou Kasinou* in the Ovgos valley, Nicosia *Ayia Paraskevi* and Marki *Alonia* in the centre of Cyprus, and Kissonerga *Mosphilia* and *Skalia* on the south-west coast[26] (**Figure III.1, Table III.1**).

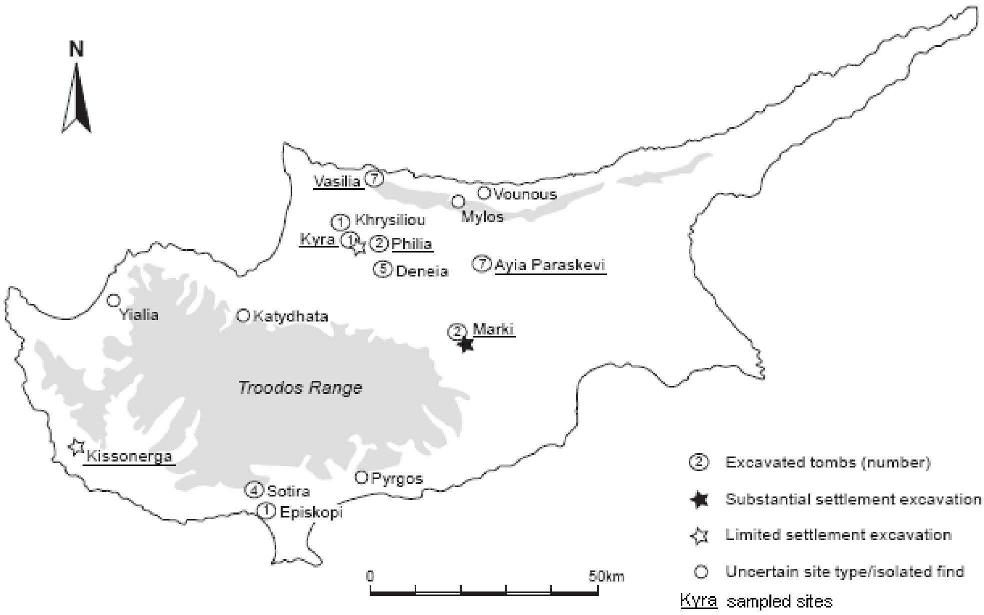


Figure III.1. Map of Cyprus showing the location of sampled and other contemporary Philia sites (original map by Frankel and Webb 2006a, fig. 11.1, 306).

ACRONYM	SITE	EXCAVATORS	NO. OF SAMPLES	RELATED PUBLICATIONS
VK	Vasilia *Kylistra*. Tomb 103.	J. R. Stewart	5	Stewart 1962
KA	Kyra *Alonia*. Trial trench IIc.	P. Dikaios	6	Dikaios 1962
PLK and PV	Philia *Laksia tou Kasinou* Tomb 1 and *Vasiliko* Tomb 3	P. Dikaios	25	Dikaios 1962
NAP	Nicosia *Ayia Paraskevi*. Tomb 27.	G. Georgiou	6	Georgiou 2002
MA	Marki *Alonia*. Settlement Units XXX-1, XII-4, XX-2, L-2, L-11, LXII-8, LXIII-4, LX-14, LX-13, IX-14, XIII-13, CI-6, CV-3, XCVIII-10, XCVIII-12, XC-10, XCVI-12, CVI-10, CXIV-2, CX-9, CXVI-8, CXXI-7, XCIII-13, XCV-11.	D. Frankel and J. Webb	39	Frankel and Webb 1996, 2006a
KM and KS	Kissonerga *Mosphilia*. Settlement units 2048, 66, 886. Kissonerga *Skalia*. Unstratified	E. Peltenburg L. Crewe	6 1	Peltenburg *et al.* 1998 Crewe *et al.* 2009
			Total: 88	

Table III.1. The sampled sites[27].

[26] The regions of the Karpass peninsula and the south coast were excluded from sampling. In the first case due to the absence of Philia material in that region, and in the latter due to delays and difficulties preventing access to material at the time of sampling.

[27]The samples collected from the Marki ceramic assemblage are labelled according to the identification number provided by the excavating team. The samples from other sites were given a sequence number at the time of sampling.

It should be highlighted that the samples included in this study exclusively belong to the RPP class of pottery as defined by Frankel and Webb (1999; 2006a, 90) and which corresponds to the standard Red Polished (Philia) ware as defined by Peltenburg *et al.* (1986, 37). This "standard" class of RPP is macroscopically distinguished by formal, well-defined shapes including jugs, hemispherical bowls, and small amphorae, fine and soft texture, very little mineral filler with a distinct abundance of voids in the clay, well smoothed, red, orange-red or brownish red surfaces with a medium to high lustre (Frankel and Webb 2006a, 90; Peltenburg *et al*. 1986, 37).

When possible, examples of the various RPP sub-varieties were included, such as incised, stroke- and band-burnished, and irregularly fired vessels, in order to assess the degree of fabric homogeneity among them, and how they are similar or differ in their manufacture, in addition to the obvious differing external surface treatments. Finally, both open and closed shapes were included in the sample, as well as small and large vessels. In comparison to the rest of the sites under study, the sites of Philia *Laksia tou Kasinou* / *Vasiliko*[28] and Marki are represented by larger numbers of samples due to the larger size of the tomb and settlement assemblages respectively. This provided an opportunity to assess the degree of fabric homogeneity within single site assemblages.

III.2. Part A: The macroscopic study of RPP ware.

Frankel and Webb (2006a) have provided detailed descriptions for all diagnostic potsherds from their excavations at Marki, and these records were used in the macroscopic study of the RPP samples coming from this settlement. The remaining RPP sampled specimens were, prior to any sample preparation, macroscopically studied and information was recorded regarding their shape, decoration, and surface treatment, degree of oxidation, fabric, hardness and wall thickness, using categories consistent with the descriptions previously determined for the Marki samples (**Appendices III.1**). The samples were then prepared for the required analyses following the procedures explained in Chapter II.

[28] *Laksia tou Kasinou* and *Vasiliko* are toponyms (place-names) referring to adjacent fields in the vicinity of the modern village of Philia, and thus the tombs located there are considered to have served the same settlement.

The macroscopic study of the RPP samples provided observations consistent with published accounts of the ware. In general the individual samples are very similar and share many common characteristics. The fabric is relatively fine in texture and of a soft grade in hardness. The most common inclusions, visible in hand specimen, are greyish beige or white in colour and rounded in shape. More rarely some brown, also rounded, inclusions are visible. In addition, almost all of the samples are characterised by the presence of small voids evenly distributed across the cross-sections of the samples. With reference to fabric, the only significant distinction is the size of the greyish beige or white inclusions, which varies among samples.

Figure III.2. a. RPP MA-16444, **b.** RPP MA-15309 and **c.** RPP PLK-22. Firing temperatures were not high enough, or did not remain high for enough time for complete oxidation of the vessels' walls. Samples RPP MA-15309 (**b**) and RPP PLK-22 (**c**) belong to the differentially fired sub-variety of RPP ware. This shows some sort of control over the firing atmosphere to produce the differentially-fired effect.

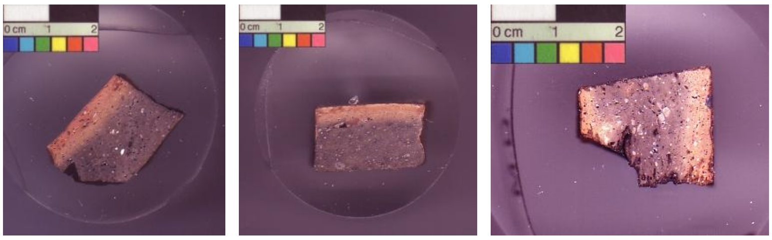


Figure III.3. a. RPP PLK-44 **b.** RPP KM-54 and **c.** RPP KA-1. These samples, even though coming from different sites, are made of similar, if not identical, fabrics and share similar firing characteristics.

Excluding the samples which are differentially fired and which are characterised by a deliberate partial blackening of the upper half of their bodies (**Figures III.2 b-c),** most of the samples are not thoroughly oxidised during firing. Actually, the unoxidised areas most of the times cover two thirds of the vessels' inner surface, while oxidation is restricted to the areas close to the vessels' external surfaces (**Figures III.2 a** and **III.3 a-c**). **Figures III.2 a** and **c** show that even the thinner walls of bowl rims could not get thoroughly oxidised, suggesting that during firing the temperatures were either generally low or did not remain high for long enough for the vessels' walls to become fully oxidised, or that these pots were fired in relatively reducing atmospheres.

Nine differentially fired RPP specimens were included in the sample, one coming from Kyra (RPP KA-3), three from Philia *Laksia tou Kasinou* (RPP PLK-22, RPP PLK-23 and RPP PLK-29) and five from Marki (RPP MA-7412, RPP MA-8789, RPP MA-8962, RPP MA-9496 and RPP MA-15309, see also **Appendix III.1**). These nine samples belong to the Black-topped sub-variety, they are mainly bowls (**Figures III.2 b-c and III.4 a**), which seem to belong to a common type with incurving sides and flat bases (Frankel and Webb 2006a, 96). Most of them bear burnishing marks on their exterior surfaces, and have black interior surfaces. Only sample RPP MA-8789 has a red interior surface, indicating a different way of firing and creating the exterior black-topped effect. RPP MA-7412 has a much higher lustre than the other samples and does not bear any obvious burnishing marks. Burnishing is evenly conducted across its surface.

The differentially fired sample from Kyra is the only sample from this RPP sub-variety which is not entirely, but only partially black-topped (**Appendix III.1**, RPP KA-3). Sample RPP MA-8962, from Marki, is the only specimen from this sub-variety to have a large closed shape and present incised decoration in the form of what seems to be a framed row of angled dashes (**Appendix III.1**); incised decoration is not found on any of the other differentially fired bowls.

Almost all of the RPP samples have thick slip layers, which do not follow systematically a specific hue or chroma, but which are all characterised by a medium to high lustre. The lustrous surfaces were achieved by burnishing before firing. In the cases of band-burnishing and stroke- or irregular-burnishing, there is a deliberate attempt by the potters to create a lustrous-in-matt or dark-on-light effect (Webb and Frankel 1999, 18).

However, it should be noted that burnishing marks can be observed even on evenly burnished RPP vessels. Actually, noticeable burnishing marks are used, in addition to other typological and stylistic criteria, to distinguish RPP from later RP pottery. The vast majority of the vessels bear vertical marks, an indication that burnishing on the external surfaces was conducted with a direction from rim to base and/or backwards (**Figure III.4a** and **c)**. Only in the case of sample RPP PLK-39 from Philia *Laksia tou Kasinou*, the burnishing marks are made parallel to the horizontal axis on the external surface of the vessel's belly, and in the cases of bowls RPP MA-8789 and RPP MA-15309 from Marki burnishing marks are diagonal on the external surface. On the other hand, as expected given the structural constraints of the vessels, the internal surfaces of bowls and closed vessels with broad necks bear horizontal burnishing marks.

Another notable technological similarity among the RPP samples under study is observed in the formation of their flat bases, which follow the same angle. According to Webb and Frankel (1999, 18), the ancient potters were attaching flat or convex discs to the lower body of the vessels by drawing up clay from the interior and the exterior surfaces. They then pared or cut clay from the exterior to form the well-known angle characterising the RPP bases (**Figure III.5. a-c**).

Figure III.4. a. RPP PLK-22, **b.** RPP KA-5 and **c.** RPP MA-13143. Most of the RPP samples share a common burnishing technique.

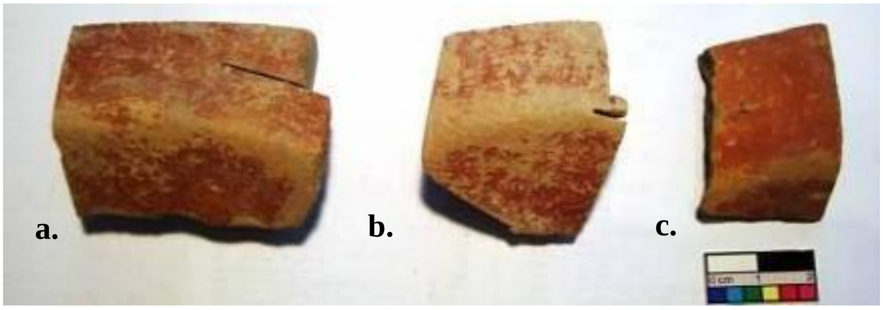


Figure III.5. a. RPP PLK-35, **b.** RPP MA-16733 and **c.** RPP KA-4. Most of the RPP samples with flat bases share common technological characteristics in the formation of the base.

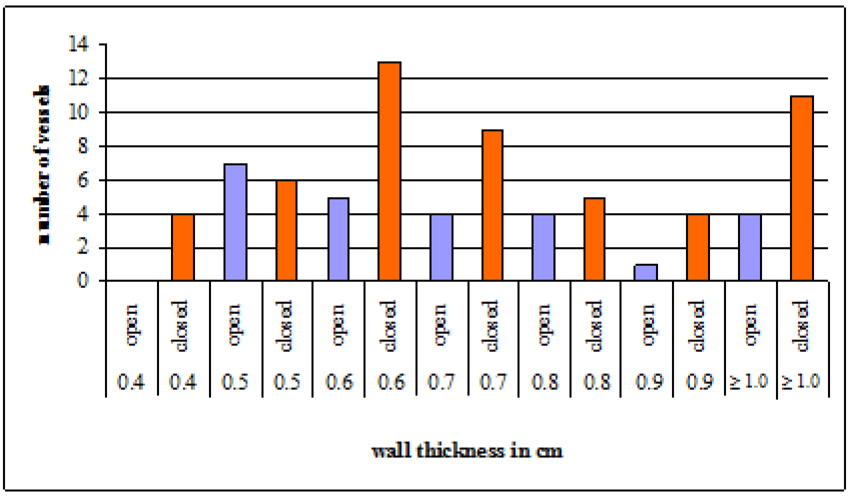


Figure III.6. The wall thickness of RPP samples according to shape.

The wall thickness depends on both the size (small or large) and the shape (open or closed) of the vessels. Considering the handmade character of the RPP pottery, it can be argued that there is some degree of standardisation in the wall thickness of small bowls which mostly ranges between 0.5 and 0.6 cm, and medium to large closed vessels which is in the range between 0.6 and 0.7 cm. Finally, the largest closed vessels for practical reasons of use range between 1 and 1.04 centimetres in wall thickness (**Figure III.6)**.

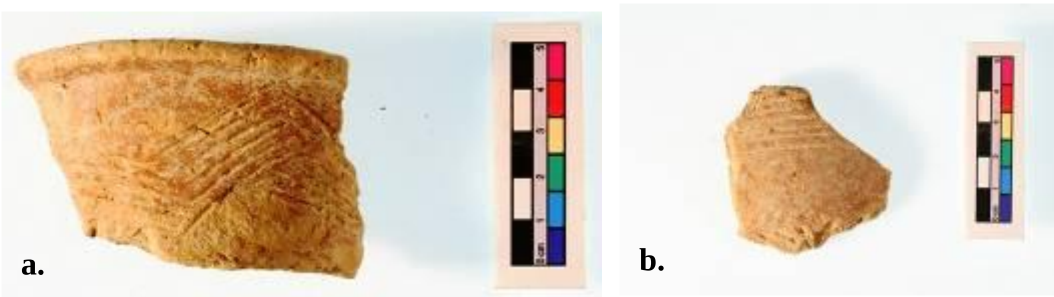


Figure III.7. a. RPP PLK-24 and **b.** RPP PLK-26 carry incised decoration in the form of multiple parallel zigzag and horizontal lines without any white paste filler.

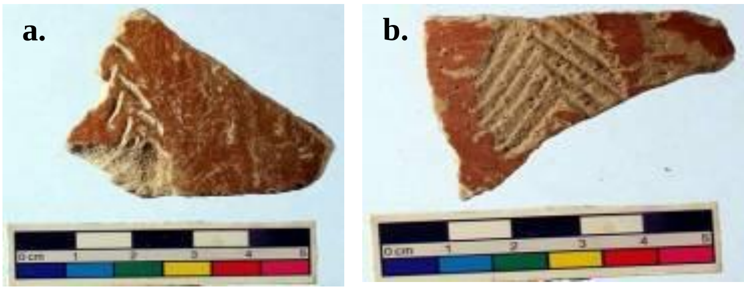


Figure III.8. a. RPP MA-9398 and **b.** RPP MA-16438, both from Marki, carry incised decoration in the form of rows of opposed angled dashes (herringbone). The incisions on 9398 are deeper and filled with white paste, while the incisions of 16438 are lighter and not filled with white paste.

RPP samples with incised motifs were sampled from the sites of Philia *Laksia tou Kasinou* (5 samples) and Marki (6 samples). The incised motifs on vessels from Philia include multiple parallel horizontal or zigzag lines (**Figure III.7. a-b)** and in contrast to some samples from Marki do not have any white paste filler. The most common incised motif among the Marki RPP samples, is the "herringbone", a motif consisting of rows of opposed angled dashes (**Figure III.8. a-b**). Whereas the incised decoration on the five samples from Philia is consistent and uniform in terms of execution, some variation is observed among the samples coming from Marki. For example, samples RPP MA-9398 and RPP MA-16438 present the same incised motif, which is however executed differently; in the former case in shorter and deeper dashes filled with white paste, in the latter case in the form of larger but shallower incisions, more carefully executed and without any white paste filler (**Figure III.8. a-b**). Incised decoration is exclusively associated with closed shapes in the RPP sample, and predominantly found on closed shapes of large size.

The broader Philia ceramic tradition also includes a certain set of conventions when it comes to decoration. For example, there is a very limited number of motifs used in incised decoration, which is predominantly applied on closed vessels. The RPP sample under study does not indicate any distinct processing of the fabrics used for vessels with incised decoration, as these vessels have similar numbers and sizes of inclusions to the rest of the samples. Furthermore, the black-topped variety predominantly includes bowls with incurved sides and flat bases. A similar selection of shape is made for irregularly burnished pottery, as stroke- or band-burnished vessels are primarily bowls.

Considering the macroscopic characteristics of the two larger samples, those from Philia *Laksia tou Kasinou* and Marki, the sample from *Laksia tou Kasinou* forms macroscopically a more homogeneous group than that from Marki. However, the observed differences mainly in surface treatment and pot building, such as the direction of burnishing marks, execution of incised motifs, and wall thickness, could be a sampling bias. The RPP samples from *Laksia tou Kasinou* come from a single tomb, whereas the RPP samples from Marki were collected from the different and more broadly dispersed contexts of a settlement, allowing consequently a broader typological or stylistic disparity. The samples from Nicosia *Ayia Paraskevi* also present some variation especially in terms of fabric, which is not observed in any of the other site samples, such as the sample from *Laksia tou Kasinou*, which is larger than that from *Ayia Paraskevi*.

Despite the variations in typological, stylistic or other manufacturing attributes of individual specimens, the RPP sample under study reflects the pronounced macroscopic homogeneity of the RPP material in general. The differences observed in the shaping, firing or surface treatment of a small number of vessels cannot be assigned to the vessels' different place of discovery. Considering the analytical results of earlier petrographic and chemical analyses (Robertson 1989; Summerhayes *et al.* 1996; Stephen 1998a), as well as the argument that these RPP vessels were indeed locally manufactured at each settlement, then the potters that made these pots seem to have followed a common recipe, which is primarily seen in the use of similar raw materials and techniques for the production of a fabric almost identical macroscopically at different sites across Cyprus.

In addition to fabric homogeneity and the close similarities in firing and surface treatment techniques, some degree of standardisation is represented by aspects of vessel building techniques, such as the attachment of bases, and the forming of identical angles between the bases and the ceramic body walls, as well as wall thicknesses. Another consistent manufacturing technique reported in other published RPP accounts involves the method of attachment of "rod handles" (or pushed-through handles), which appears for the first time on the island during the Philia phase and which continues to be used in the production of later RP types (Webb and Frankel 1999, 18).

Considering the fact that RPP pottery is handmade, it is really astonishing how uniform in fabric, morphology, and style, vessels which are considered to come from different production loci can be. The petrographic and chemical analyses that follow aim to investigate in greater detail the ancient technology of RPP pottery, as well as to assess the samples' provenance in an attempt to understand better this well-established ceramic tradition and evaluate earlier analytical results using this combination of compositional techniques on a larger sample.

III.3. Part B: The RPP analytical datasets.

III.3.a. The petrographic data.

The main method employed for the compositional study of the RPP sample is petrography. The 88 RPP samples were divided into fabrics following the guidelines and procedures explained in Chapter II. For reasons of clarity, references to individual samples are made using a combination of the site's initials, the ceramic ware's acronym and the identification number of each sample; for example RPP MA-9117 refers to Red Polished Philia sample 9117 from Marki (see also abbreviations table).

The 88 RPP samples were divided into four different fabrics (fabrics I to IV, **Table III.2**). Eleven samples could not be allocated to any of these fabric groupings, as they do not present any mineralogical similarities between them, and were thus ascribed as outliers. A detailed description of each of the four fabrics, as defined by petrography, can be found in **Appendix III.2**.

FABRIC I: MICRITIC LIMESTONE RICH FABRIC WITH FEW FRAGMENTS OF CHERT AND TCFS	Overall %
RPP KA-1, RPP KA-2, RPP KA-4, RPP KA-5, RPP KA-6, RPP NAP-8, RPP NAP-10, RPP NAP-12, RPP NAP-13, RPP VK-17, RPP VK-18, RPP VK-19, RPP VK-20, RPP VK-21, RPP PLK-22, RPP PLK-23, RPP PLK-24, RPP PLK-25, RPP PLK-26, RPP PLK-27, RPP PLK-28, RPP PLK-29, RPP PLK-31, RPP PLK-33, RPP PLK-34, RPP PLK-35, RPP PLK-37, RPP PLK-38, RPP PLK-39, RPP PLK-40, RPP PLK-41, RPP PLK-42, RPP PLK-43, RPP PLK-44, RPP PLK-45, RPP PV-46, RPP PV-47, RPP PV-49, RPP PV-50, RPP KM-51, RPP KM-52, RPP KM-53, RPP KM-54, RPP KM-55, RPP KM-56, RPP KS-57, RPP MA-3570, RPP MA-7229, RPP MA-7428, RPP MA-8789, RPP MA-8962, RPP MA-9369, RPP MA-9496, RPP MA-9999, RPP MA-13067, RPP MA-13143, RPP MA-14228, RPP MA-14361, RPP MA-14370, RPP MA-15316, RPP MA-15337, RPP MA-16438, RPP MA-16444, RPP MA-16486, RPP MA-16511, RPP MA-16733 (66 samples)	**75%**
FABRIC II: MICRITIC LIMESTONE RICH FABRIC WITH MICROFOSSILS AND VARIOUS IGNEOUS INCLUSIONS	**Overall %**
RPP MA-5096, RPP MA-5104, RPP MA-9117, RPP MA-12371, RPP MA-13085, RPP MA-16408, RPP MA-16480, RPP MA-16530 (8 samples)	**9%**
FABRIC III: IGNEOUS FABRIC WITH SOME MICRITIC LIMESTONE FRAGMENTS AND MICROFOSSILS, AND FREQUENT PRESENCE OF ACFS	**Overall %**
RPP MA-4258, RPP MA-12213, RPP MA-14279, RPP MA-15309 (4 samples)	**4.5%**
FABRIC IV: BIOTITE MICA RICH FABRIC WITH VARIOUS IGNEOUS INCLUSIONS	**Overall %**
RPP NAP-11, RPP MA-5094, RPP MA-7427, RPP MA-10101 (4 samples)	**4.5%**
OUTLIERS	**Overall %**
RPP KA-3, RPP NAP-16, RPP MA-7412, RPP MA-9398, RPP MA-15461, RPP MA-16452 (6 samples)	**7%**

Table III.2. The Philia fabrics as defined by petrography (see also **Appendix III.2**).

Considering the fabric descriptions in **Appendix III.2**, there are some clear differentiations in fabric among the Philia pottery. Fabric group I is a micritic limestone enriched fabric, the largest cluster of samples, consisting of 75% of the RPP samples under study. Moreover, it includes most of the RPP samples from Marki (twenty samples – 51.3% of the Marki RPP sample), and almost all of the samples from the rest of the sites (the exceptions are one sample from Kyra *Alonia* and two samples from Nicosia *Ayia Paraskevi*).

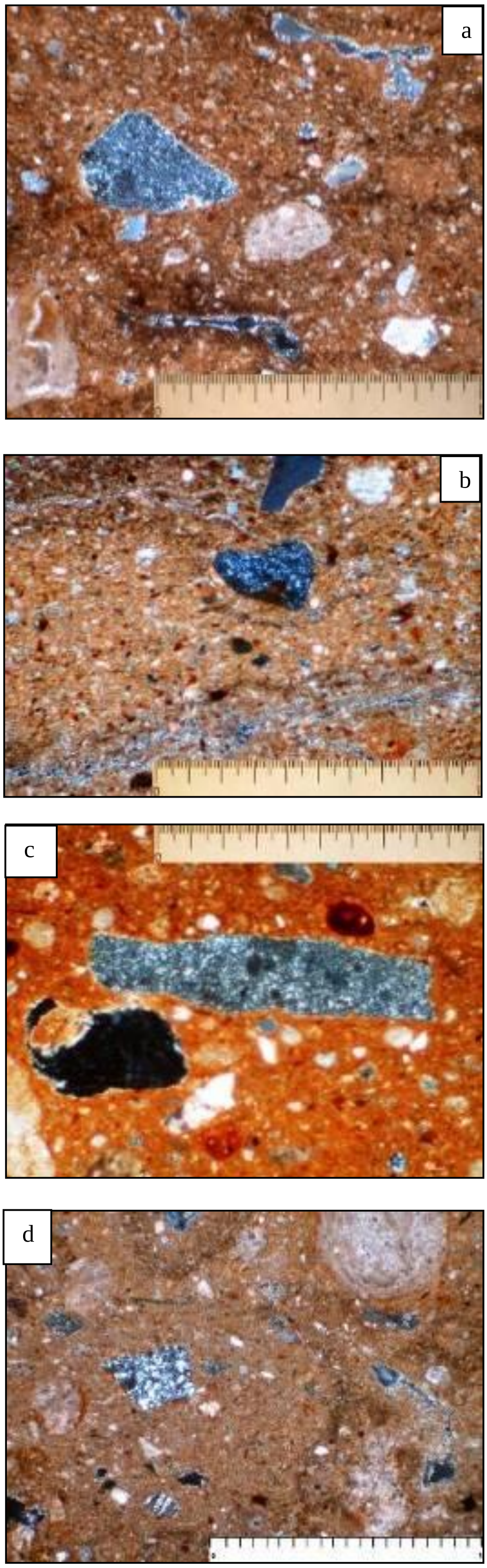


Figure III.9. a. RPP KA-6, **b.** RPP NAP-10, c**.** RPP PLK-21, **d.** RPP KM-52. Even though these samples come from different site assemblages or belong to different wares, they are made of the same fabric I. The presence of chert in the matrix of micritic clay distinguishes it from the other Philia fabrics (XP, full scale 1mm).

Fabric I is significantly different from the other Philia fabrics. Fabric I is associated with metamorphic minerals and rocks, such as chert (**Figure III.9 a-d**), quartzite (**Figure III.10**), and some rare laths of muscovite mica (**Figure III.11 a-b**). In addition to the presence of metamorphic elements, fabric I is characterised by the predominant presence of micritic limestone (**Figure III.12 a-d**). Tcfs (clay pellets) are also frequent in this fabric, and together with limestone are the only types of inclusion in relatively large sizes (limestone reaches 5.4 mm in long diameter and tcfs reach 2 mm in long diameter: **Figure III.13 a-b**).

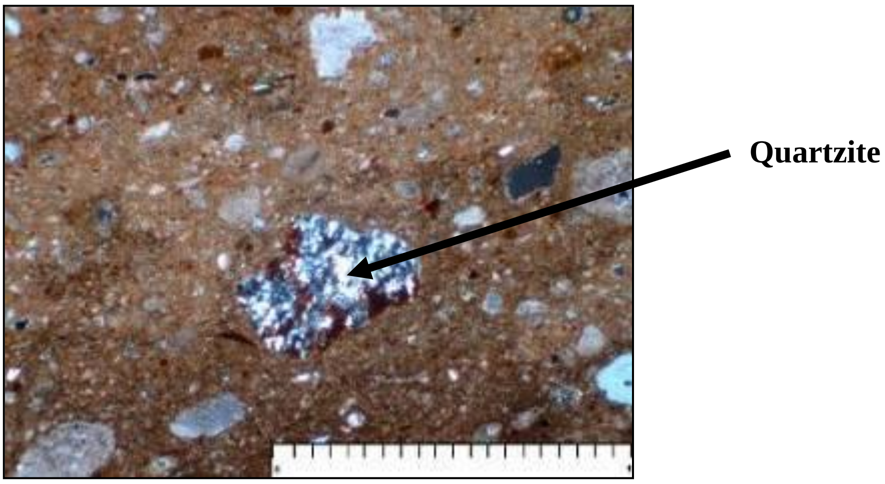
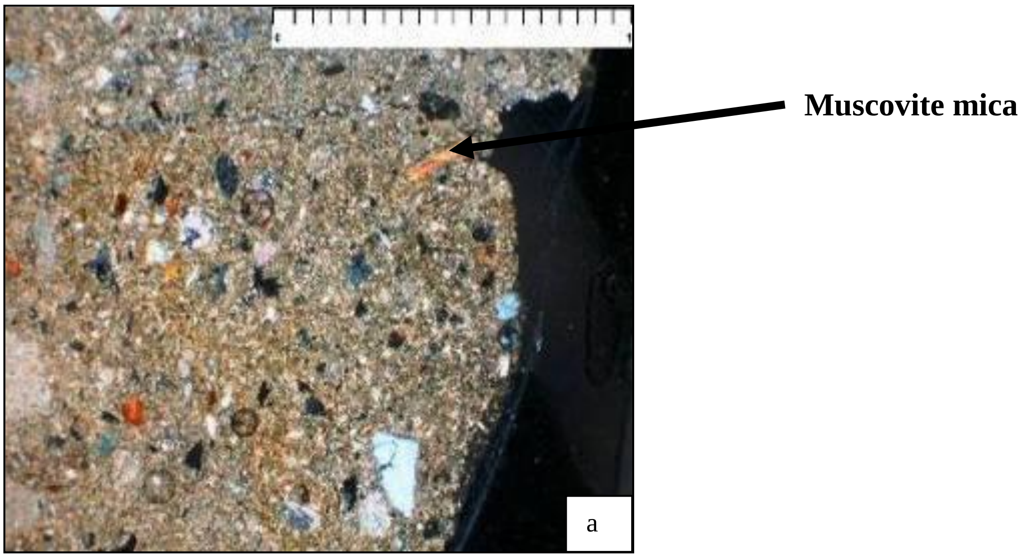


Figure III.10. Photomicrograph of sample RPP KM-50 showing the rare presence of quartzite in fabric I (XP, full scale 1mm).



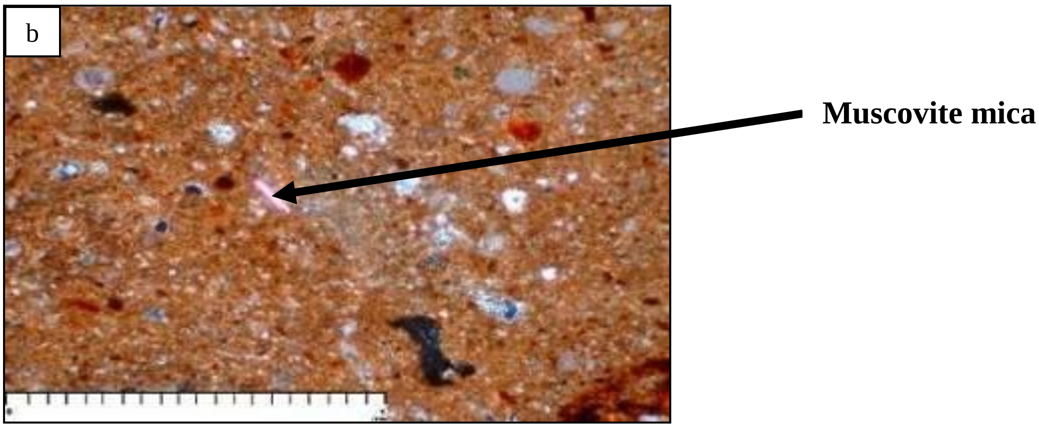
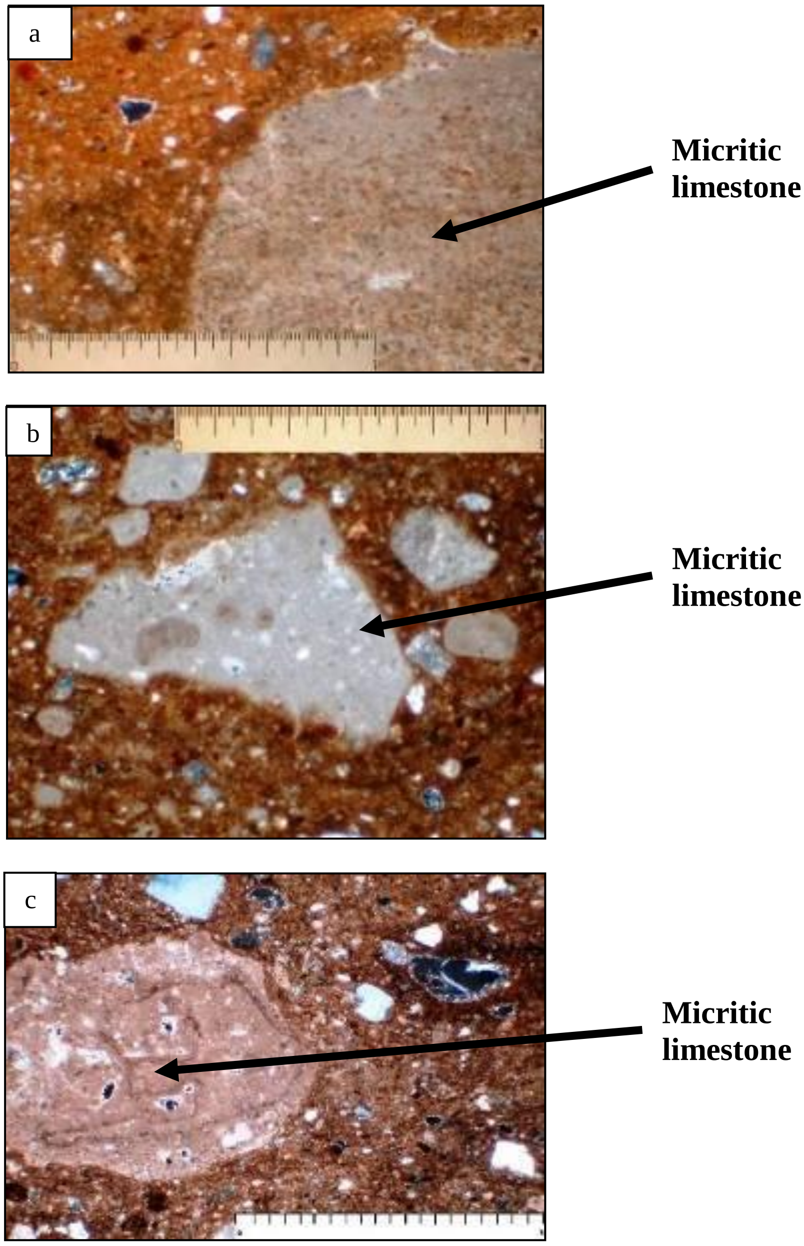


Figure III.11. a-b. Photomicrographs of samples RPP KA-1 (**a**) and RPP PLK-37 (**b**) show rare laths of muscovite mica, the presence of which characterises fabric I (XP, full scale 1mm).



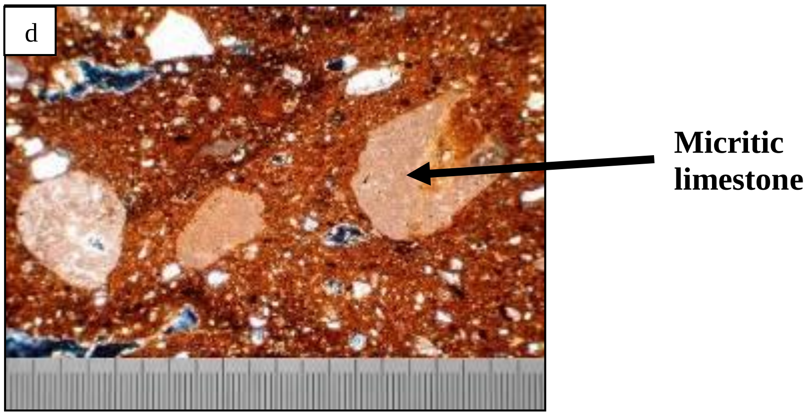


Figure III.12. a-d. Photomicrographs of RPP KA-5 (**a**), RPP PLK-21 (**b**), RPP KM-52 (**c**), and RPP MA-9999 (**d**) show the predominant presence of micritic limestone in fabric I (XP, full scale 1mm).

The most significant difference observed among the samples of fabric group I is related to the size of limestone in the samples' clay matrices **(Figure III.12 a-d)**, which varies from coarse to fine. However, the inconsistent size of limestone is not used as a criterion for dividing the samples into further sub-groups. There is no association between rock-size variability and specific sites or the typological attributes of individual samples. Most importantly, fabric group I, despite this variability in the size of limestone fragments, is otherwise very homogeneous, and can be easily distinguished in thin section from all the other fabrics.

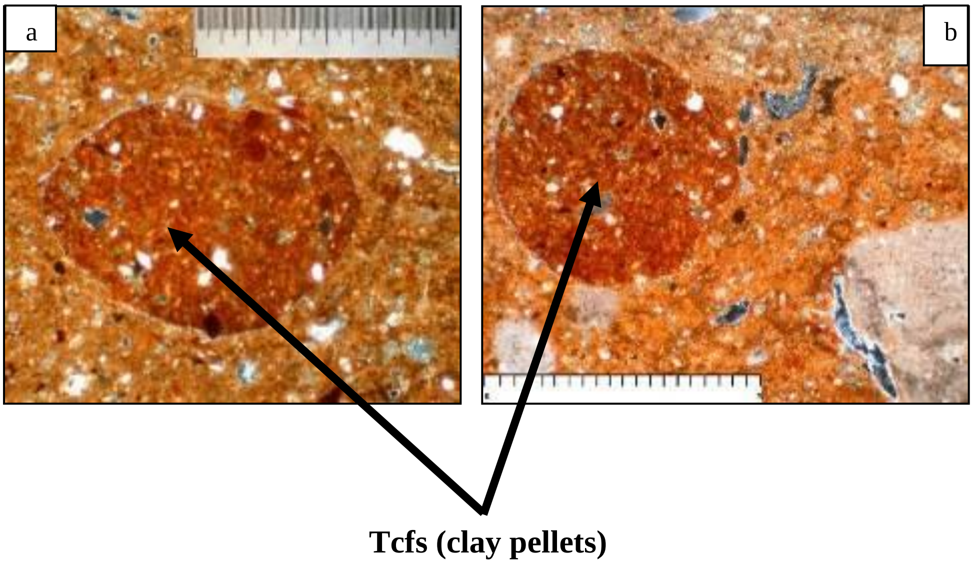


Figure III.13. a-b. Tcfs are frequent inclusions in fabric I, as seen in the photomicrographs of samples RPP VK-17 (**a**) and RPP PLK-34 (**b**) (XP, full scale 1mm).

This fabric homogeneity can be explained on both mineralogical and technological terms. Fabric I is a fine fabric with only a very restricted number of inclusions exceeding 0.3 mm in long diameter (see **Figure III.11 a-b**); the exceptions being micritic limestone fragments and tcfs which vary in size. The fineness of the fabric suggests that the potters exploited systematically the same raw material resources, collecting fine sediments. It cannot be argued that the raw materials were refined with great care, because of the large limestone fragments' and tcfs' size. As argued below, it is likely that all of these inclusions were naturally present in the clays.

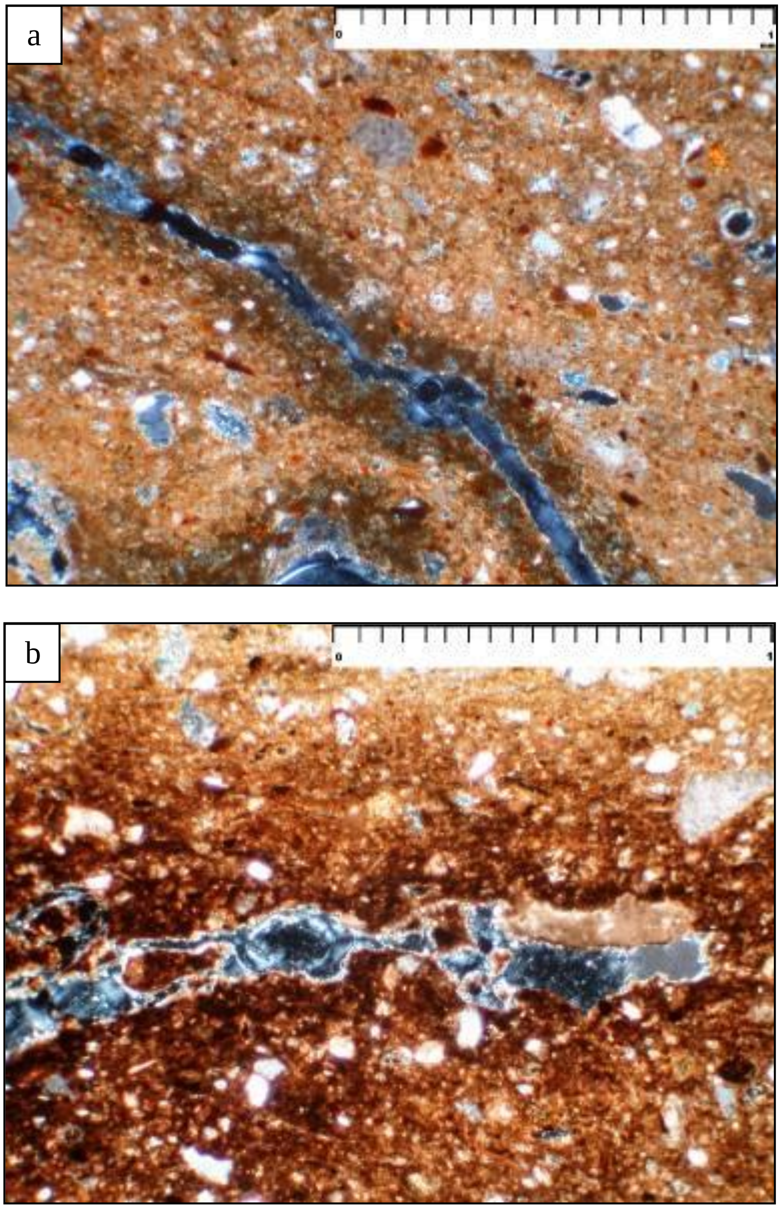


Figure III.14. a. RPP PLK-27, **b.** RPP KM-51. Both samples are made with fabric I for the preparation of which organic temper was used, and which after firing resulted in the numerous voids seen both in hand-specimen and thin section (XP, full scale 1mm).

Moreover, all of the samples of fabric I present meso and micro voids, which sometimes are blackened around their margins (**Figure III.14 a-b**). This information coupled with macroscopic observations of numerous voids in hand specimens reinforces the argument that organic temper was used in the production of RPP pottery, and in particular for the production of fabric I. In addition, the common reduced areas around the circumferences of voids suggest that the firing temperatures were kept low, or were not maintained high for long enough for a thorough burning of the organic matter.

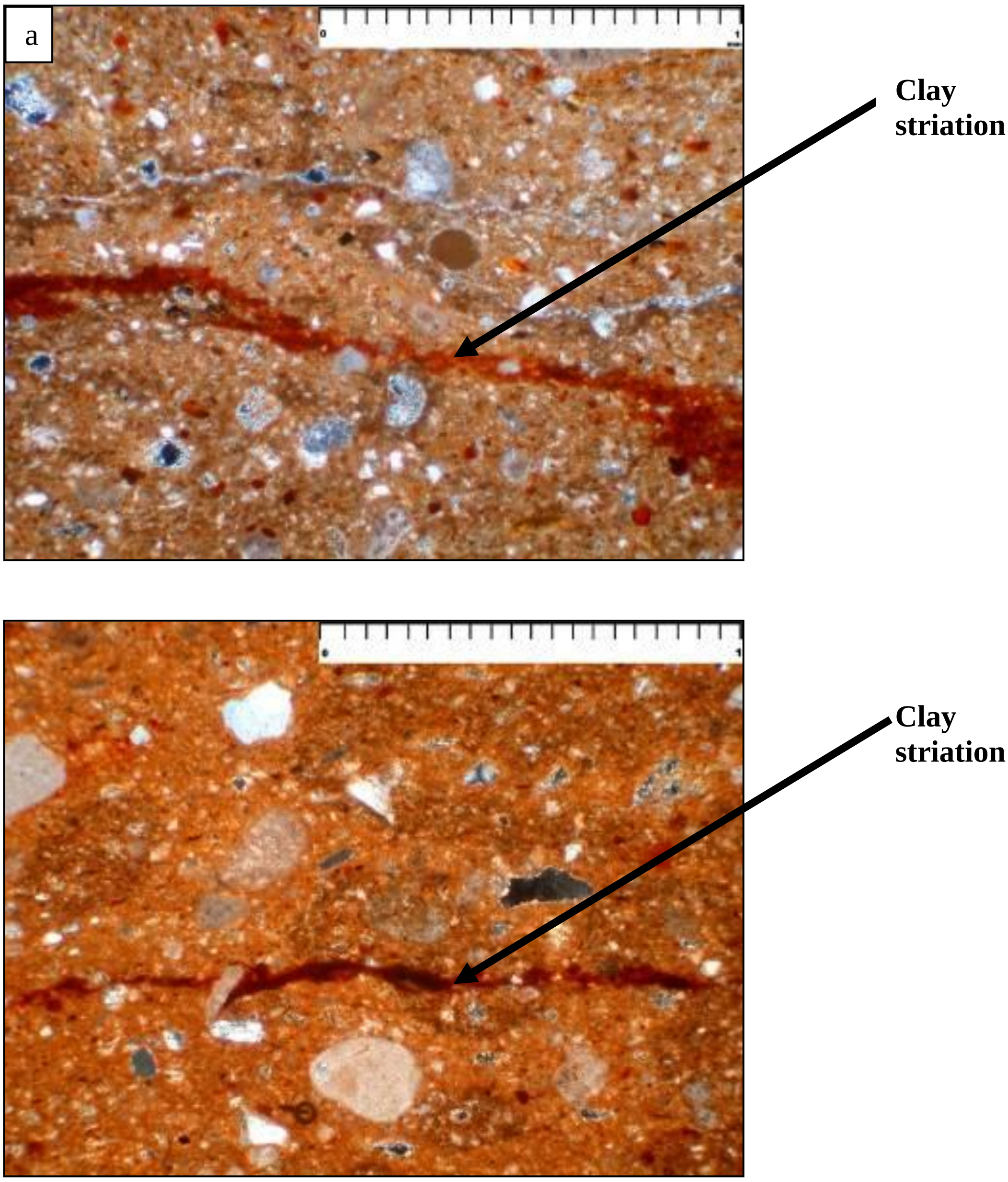


Figure III.15. a. RPP PLK-27 and **b.** RPP NAP-12 made with fabric I and present evidence of clay mixing in the form of red clay striations (XP, full scale 1mm).

The presence of clay striations (**Figure III. 15 a-b**) in the microstructure of most of the samples made of fabric I, coupled with the presence of different textural areas in some of the thin sections (**Figure III. 16**) can be used as strong evidence for clay mixing. Clay mixing can be either a result of natural intermixing, or can be achieved artificially. The great difference between the size of micritic limestone fragments and that of other inclusions suggests that micritic clays from sedimentary deposits were intermixed with other types of clay, less calcareous. A natural intermixing of clays and inclusive materials can explain the round and sub-rounded shapes of micritic limestone fragments, which could result from natural and continuous weathering and intermixture of the material.

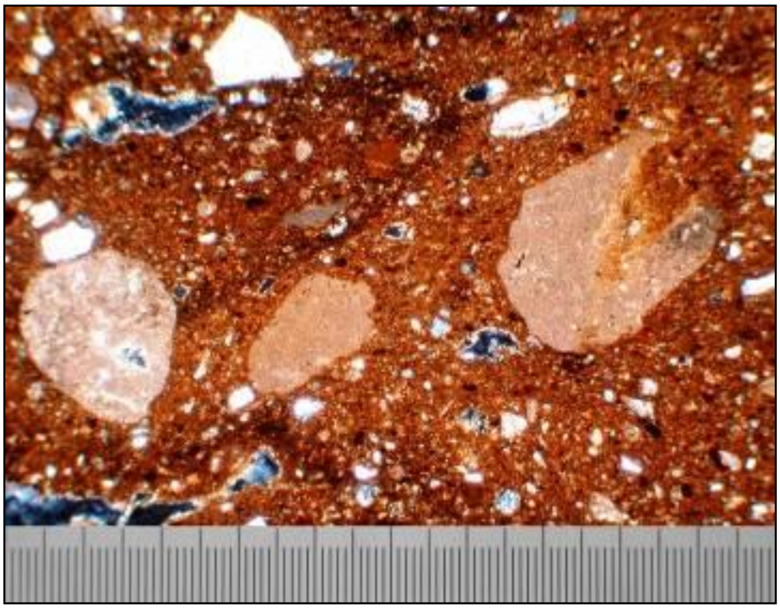


Figure III.16. RPP MA-9999 presents evidence for clay intermixing. The fragments of micritic limestone form part of the lighter in colour clay, whereas a fragment of what seems to be serpentine (centre upper half) forms part of the second, darker clay (XP, full scale 1 mm).

Fabric II, like fabric I, has a strong sedimentary character, primarily reflected in the dominant presence of micritic limestone fragments. In addition to the presence of chert and other metamorphic inclusions in fabric I, what differentiates the samples of fabric II from those of fabric I is the more frequent presence of calcite and calcite-filled microfossils in fabric II. While in fabric I the rarely-found microfossils are open and not calcite-filled, distributed across the section and almost never within the limestone fragments[29], in fabric II microfossils are frequent constituents of the fabric found across the section and within the limestone fragments (**Figure III.17**).

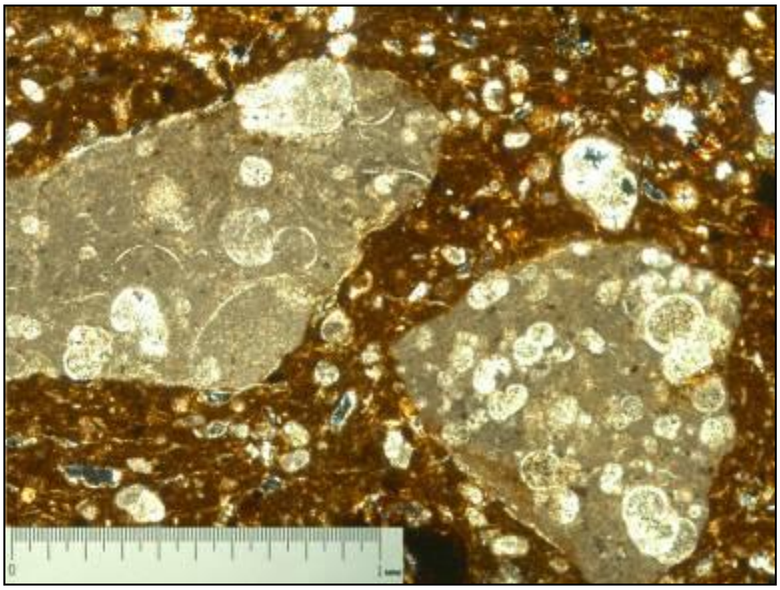


Figure III.17. The dominant presence of micritic limestone and calcite-filled microfossils in the clay matrix of RPP MA-12371. This sample is made with fabric II (XP, full scale 1 mm).

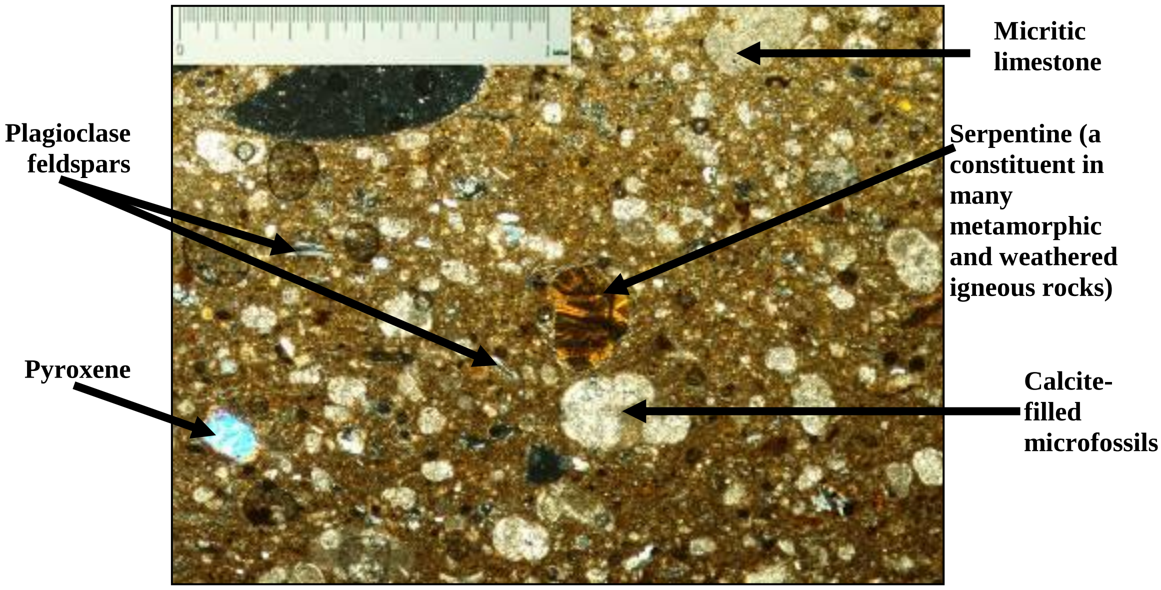


Figure III.18. The coexistence of igneous and sedimentary materials in RPP MA-13085, a sample made with fabric II (XP, full scale 1mm).

Another significant characteristic of fabric II, is the coexistence of this sedimentary material in the form of micritic limestone and microfossils with fragments of basalt and dolerite, orthopyroxene and clinopyroxene, alkali and plagioclase feldspars, rocks and rock-forming minerals, all of which are classified as

[29] Only in the cases of RPP PLK-28 and RPP MA-7229, both samples allocated to fabric I, calcite filled microfossils are found within limestone fragments.

igneous in nature. It should be noted, however, that the sedimentary materials predominate in fabric II, in comparison with the restricted presence of igneous materials. These igneous rocks and rock-forming minerals are mainly small in size, rarely exceeding 0.6mm in long diameter, angular in shape and have low sphericity (**Figures III. 18**). The coexistence of sedimentary and igneous components in fabric II in combination with the variability in mineral and rock size could be used to argue that the raw materials for the production of this fabric were collected from river alluvial deposits, where materials of different nature were intermixed.

As can be observed in **Figure III.19,** amorphous concentration features (hereafter acfs) are found frequently dispersed across the sections of samples made with fabric II. Acfs (see Whitbread 1986 and 1995) are in the form of dark brown opaques with sharp boundaries, rounded to well-rounded in shape, with high optical density (Whitbread 1986, table 1, 80; also 1995, 386).

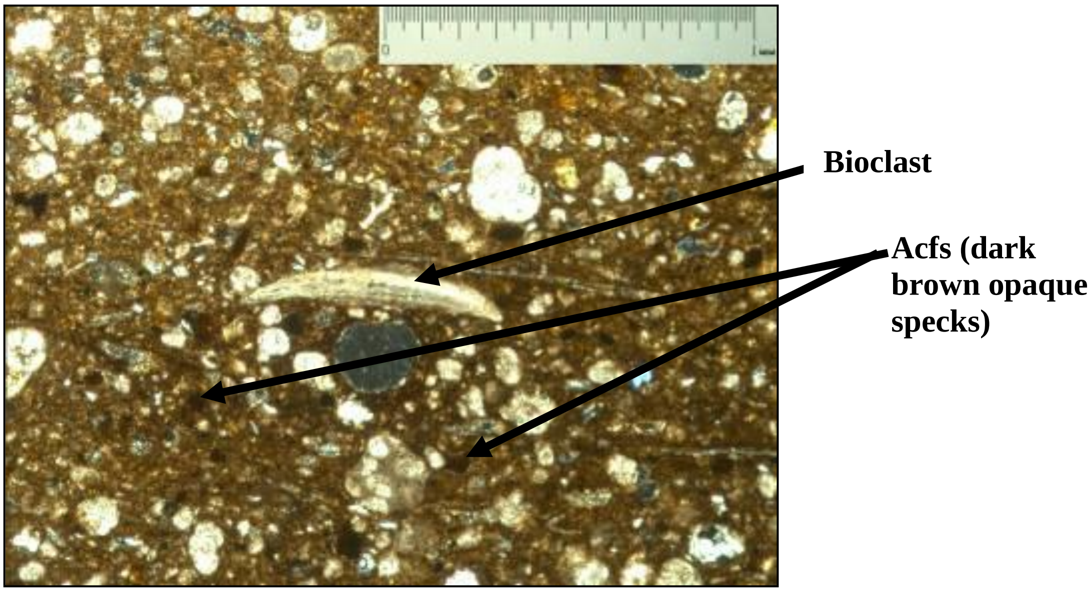


Figure III.19. The frequent presence of acfs in RPP MA-13085. This sample is made with fabric II (PPL, full scale 1mm).

Finally, skeletal particles or bioclasts are also found in some samples made with fabric II. These are the fragmented remains of "the hard parts of carbonate-secreting organisms" (Adams *et al.* 1994, 39). In fabric II, bioclasts are primarily elongated in shape, approximately 1mm in length and they are characterised by low sphericity (**Figures III.19** and **III.20**). The bioclast illustrated in **Figure III.19** belongs to the molluscs' category. In this case the shell mould is filled with calcite crystals. The bioclast illustrated in **Figure III.20** belongs to the brachiopods category

(Tucker 2008, 120; Adams *et al.* 1984, 42), and it is sectioned parallel to its length. The fibres adjacent to the pseudopunctate brachiopod have a wavy nature. These bioclasts are common components of limestones and therefore their presence in fabric II is not a surprise as this fabric is rich in micritic limestone, and in particular fossiliferous limestone.

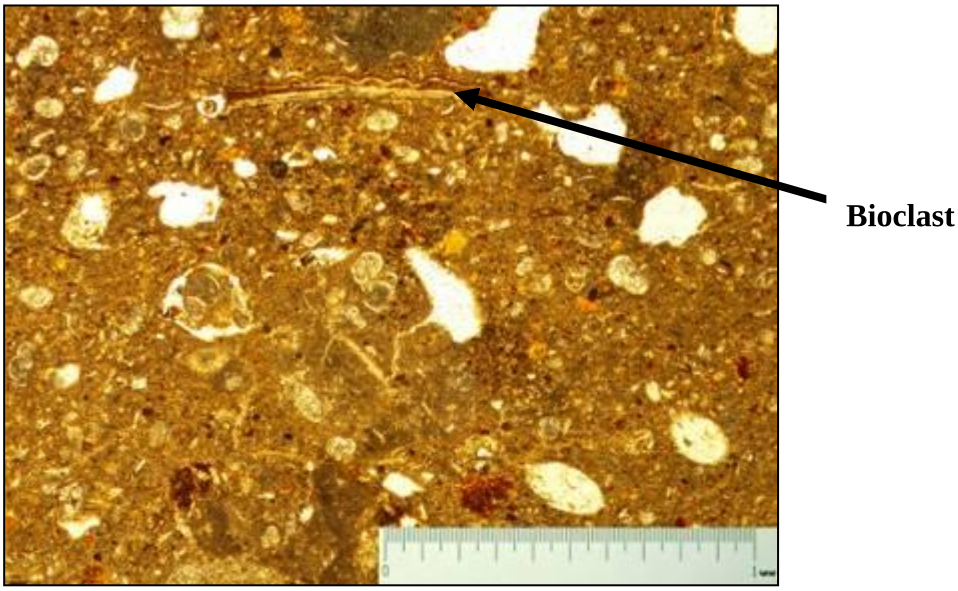


Figure III.20. A bioclast in RPP MA-16408. This sample is made with fabric II (PPL, full scale 1mm).

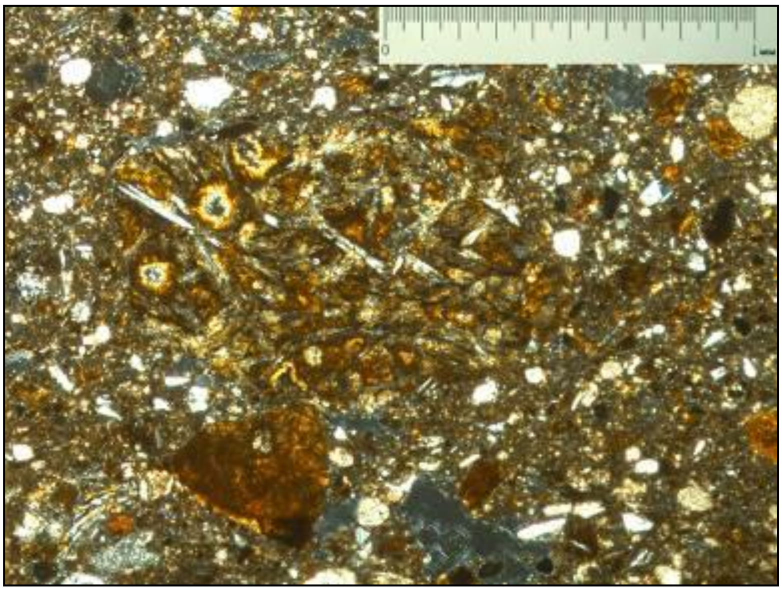


Figure III.21. Igneous components in RPP MA-4258, a sample made with fabric III (XP, full scale 1mm).

Fabric III is very similar in composition to the aforementioned fabric II. However they are differentiated on the basis of the density, distribution and the organisation of the inclusions across the section. Specifically, while both fabrics are fossiliferous and characterised by the dominant presence of micritic limestone in their composition, only rarely microfossils are recorded in the micritic limestone fragments recorded in fabric III. These fragments of micritic limestone are in almost all cases contaminated with fragments of minerals also found in the surrounding clay matrices, such as quartz, feldspars and serpentine. Moreover, calcite is found more frequently in fabric III than in fabric II, as well as serpentine and plagioclase feldspars.

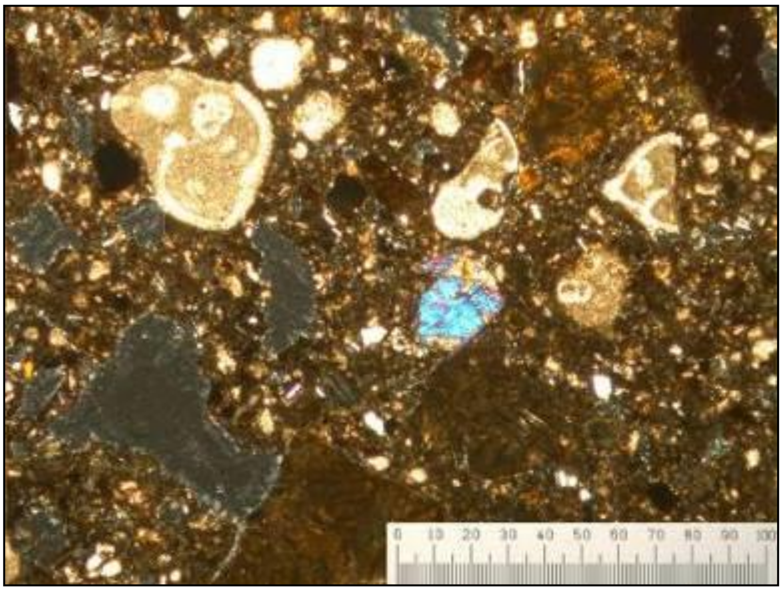


Figure III.22. The coexistence of igneous and sedimentary components in RPP MA-4258, a sample made with fabric III (XP, full scale 1mm).

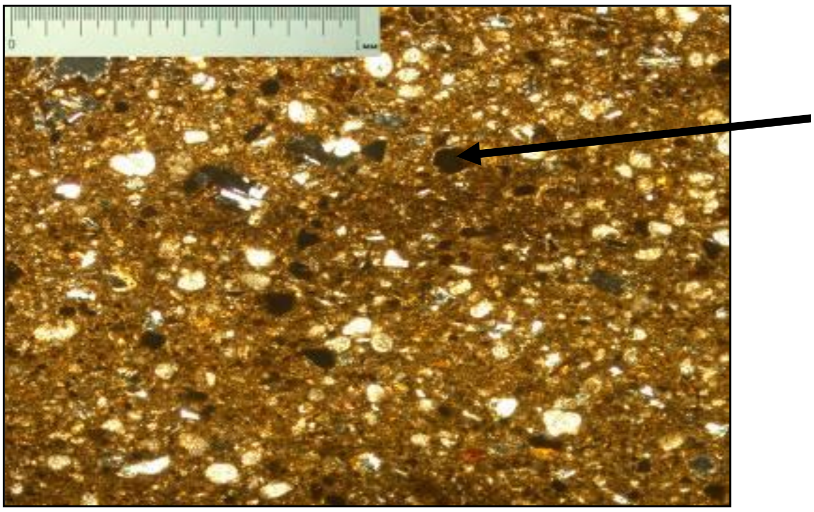


Figure III.23. The distinct presence of acfs in RPP MA-14279, a sample made with fabric III (XP, full scale 1mm).

As in fabric II, the coexistence of sedimentary materials, such as microfossils, calcite and micritic limestone, with igneous materials, such as pyroxenes and basalts, is also evident (**Figures III.21** and **III.22)**. Similarly to fabric II, this observation, in combination with the variability in mineral and rock size, could be used to argue that the raw materials for the production of this fabric were collected from river alluvial deposits, where materials of different nature were intermixed.

Another common characteristic in both fabrics is the abundance of acfs. However, the number of acfs in fabric III is even greater than in fabric II (**Figure III.23)**. Most of the acfs in fabric III are sub-angular and sub-rounded dark brown opaques, randomly orientated across the sections of the samples. Some of them reach 0.5 mm in long diameter, but most of them are smaller in size, approximately 0.05 mm in long diameter. Acfs are also recorded in some cases within the micritic limestone fragments.

Overall, it can be argued that the raw materials for the production of fabrics II and III derive from the same geological region as they share many common, mineralogical characteristics. The two fabrics are compositionally very similar, however the samples recorded to be made with these two fabrics, are divided into two different fabric clusters because there is somewhat greater density of igneous inclusions in fabric III and a more distinct presence of microfossils within the micritic limestone fragments of fabric II. While the limestone fragments in fabric II contain microfossils, the limestone fragments in fabric III contain various inclusions, such as plagioclases, serpentine, biotite, and only in rare cases some microfossils. Moreover, in fabric III, some rock fragments are altered. For example in some basalts, the plagioclases are altered to biotite.

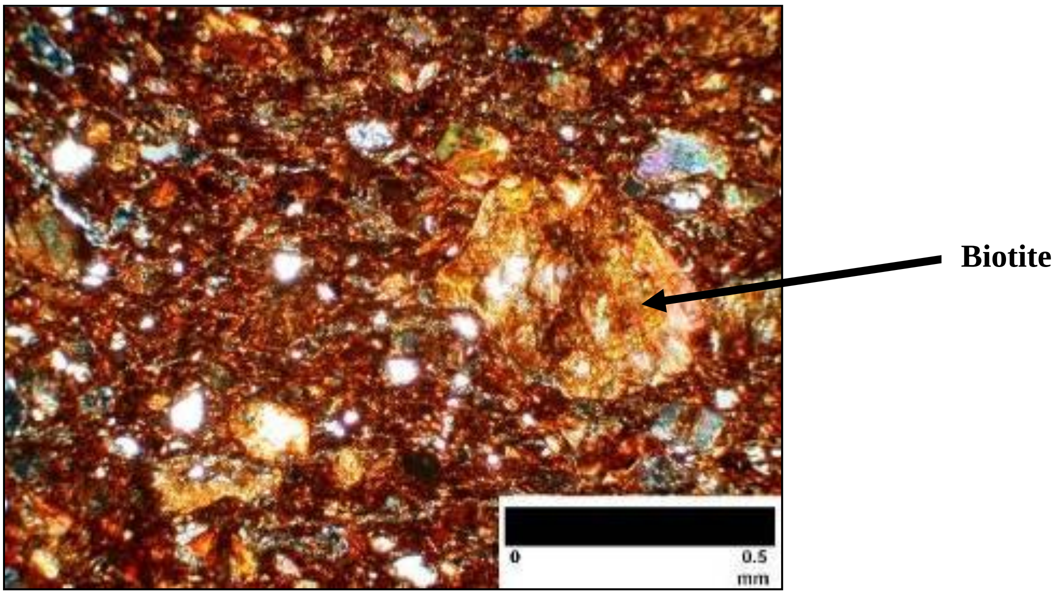


Figure III.24. RPP MA-5094 is made with the biotite-rich fabric IV (XP, full scale 0.5mm).

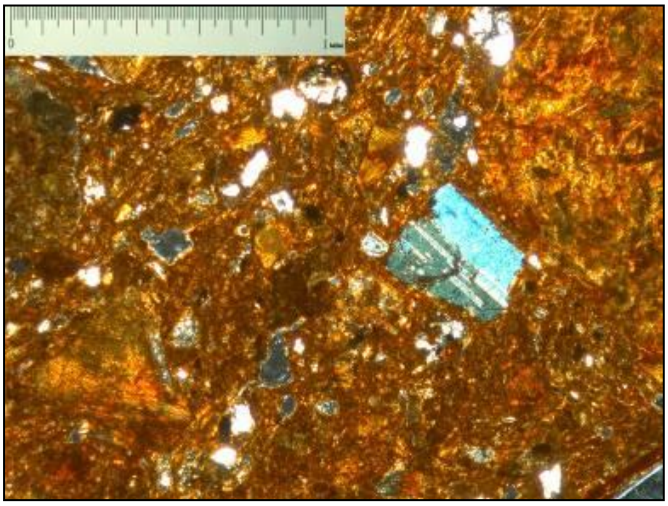


Figure III.25. RPP NAP-11 is the only sample made with the biotite-rich fabric IV that does not belong to the Marki assemblage, but rather comes from Nicosia *Ayia Paraskevi* (XP, scale 1mm).

In contrast to the aforementioned fabrics I, II and III, all of which have a strong sedimentary character, fabric IV is made primarily of igneous materials, characterised by almost a total absence of any calciferous inclusions. This is the coarsest fabric recorded; there is a dense presence of igneous minerals and rocks, the size of which sometimes reaches 2.5 mm in long diameter. Biotite mica is the predominant mineral in the composition of fabric IV (**Figures III.24** and **III.25**). Other igneous inclusions recorded are clinopyroxene, dolerite olivine, polycrystalline quartz and plagioclase feldspars (**Figures III.26** and **III.27**). In a few very rare cases, some calcite-filled microfossils are also observed among the igneous components (**Figures III.26** and **III.27**).

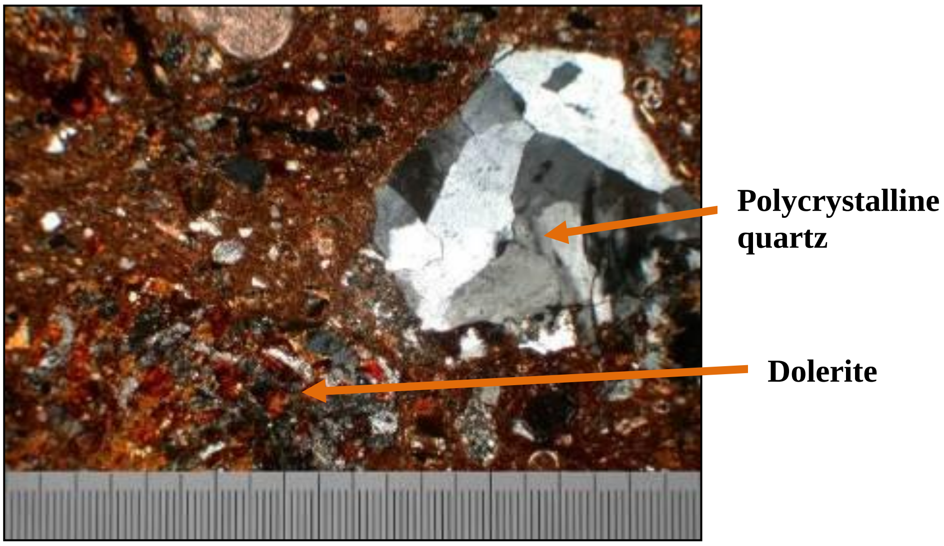


Figure III.26. RPP MA-10101 (XP, full scale 1mm). A large fragment of polycrystalline quartz is illustrated in the right side of the photomicrograph. A fragment of dolerite is also visible at the left lower end. At the very top a calcite-filled microfossil is also visible.

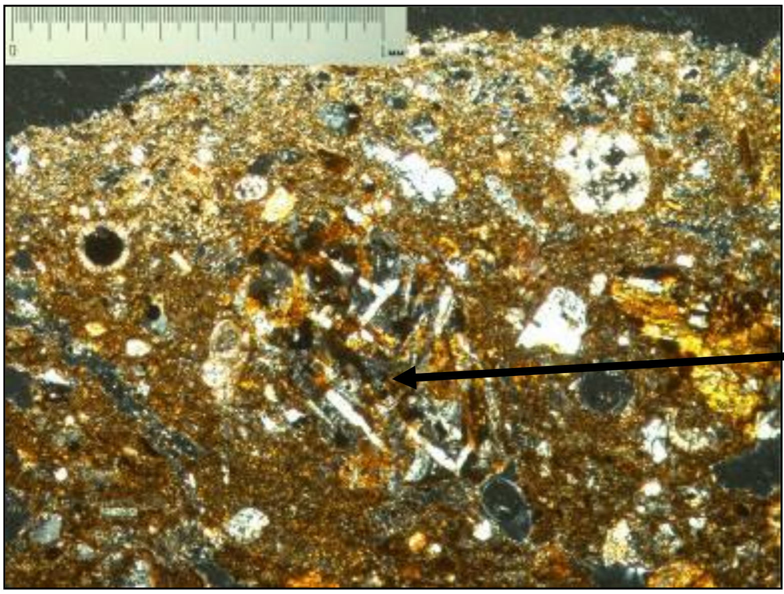


Figure III.27. RPP MA-7427 (XP, full scale 1mm). The distinct presence of igneous components in fabric IV. Rarely some microfossils are also visible.

Six samples could not be allocated to any of the four fabrics, and were thus categorised as outliers. Even if some of these specimens present similar mineralogical characteristics to the already defined fabrics, nevertheless they were differentiated as outliers either due to significant differences in the density and organisation of the inclusions within the section, or due to differences in the texture or the clay matrix. The number of outliers recorded is especially interesting as it contributes to the overall variability within the sample; this issue will be discussed further below.

In general, it should be noted that from the four fabrics and six outliers, the samples belonging to fabric I form the most homogeneous group, and they are mineralogically distinctively different from all the other RPP samples, deriving from a different geological environment. Fabric I is the only recorded fabric that contains chert, and the only fabric that is not characterised by the presence of igneous components. The distinct presence of metamorphic inclusions and the restricted presence of any igneous components suggests that the raw materials for the production of fabric I were collected from northern areas, in a distance from the Troodos massif.

The rest of the fabrics and outlier samples contain igneous materials, such as basalts and dolerites, and igneous rock forming minerals, such as plagioclase feldspars, biotite, pyroxene and olivine. In fabrics II and III, the igneous components are outmatched by carbonates, in particular micritic limestone, microfossils and other types of bioclasts. Fabric IV, on the other hand, belongs to the opposite end of the fabrics' spectrum, where igneous inclusions predominate in the clay groundmass. Regardless of the degree of concentration of sedimentary or igneous materials in these samples, it could be stated that the raw materials for the production of fabrics II, III and IV, as well as for the production of most, if not all, of the outliers, were collected from the broader central-south region, around the Troodos mountain range (Gass 1960; Pantazis 1973).

III.3.b. The chemical data

From the 88 RPP samples that were studied employing petrography, 80 samples were also studied with the use ED-XRF[30], for the characterisation of their chemical compositions. The ED-XRF sample includes representatives from all fabrics and most of the outliers, as defined by petrography, as well as all the different wares. The analytical dataset can be found in **Appendix III.3.a**. A restricted number of samples were also prepared into polished cross-sections, in the way explained in Chapter II, and analysed using SEM-EDS technology. Only 35 Philia samples were analysed in total using SEM-EDS, as the preparation of samples into polished cross-sections and their microstructural analysis are particularly time-consuming. The samples selected for SEM-EDS analysis were chosen primarily for their thick, well-preserved slips. SEM-EDS was employed especially for the elemental characterisation of RPP slips and the study of the degree of clay particle vitrification of the RPP clay matrices (see sections III.3.c and III.3.d). However, some information about the elemental composition of individual inclusions within the RPP clay matrices and the body of the RPP vessels was also recorded.

Appendix III.3.b shows the arithmetic mean of the **ED-XRF** measurements taken from samples composing each fabric group as defined by petrography, the standard deviation and coefficient of variation among these measurements and the maximum and minimum values for each compound. The bulk chemical characterisation of the ceramic samples is closely associated with the mineralogical composition of the fabrics. The presence of minerals, their proportion and the size of

[30] The remaining eight specimens were not prepared into powder-pressed pellets for the ED-XRF analysis due to their small sizes; they were not adequately large for the preparation of both thin sections and powder-pressed pellets, and were made only into thin sections.

particles are important factors in explaining the chemical composition of individual samples and fabrics. Overall, it can be argued that the chemically more diverse fabric II is also mineralogically more heterogeneous, while the mineralogical homogeneity within fabrics I, III and IV is also chemically confirmed.

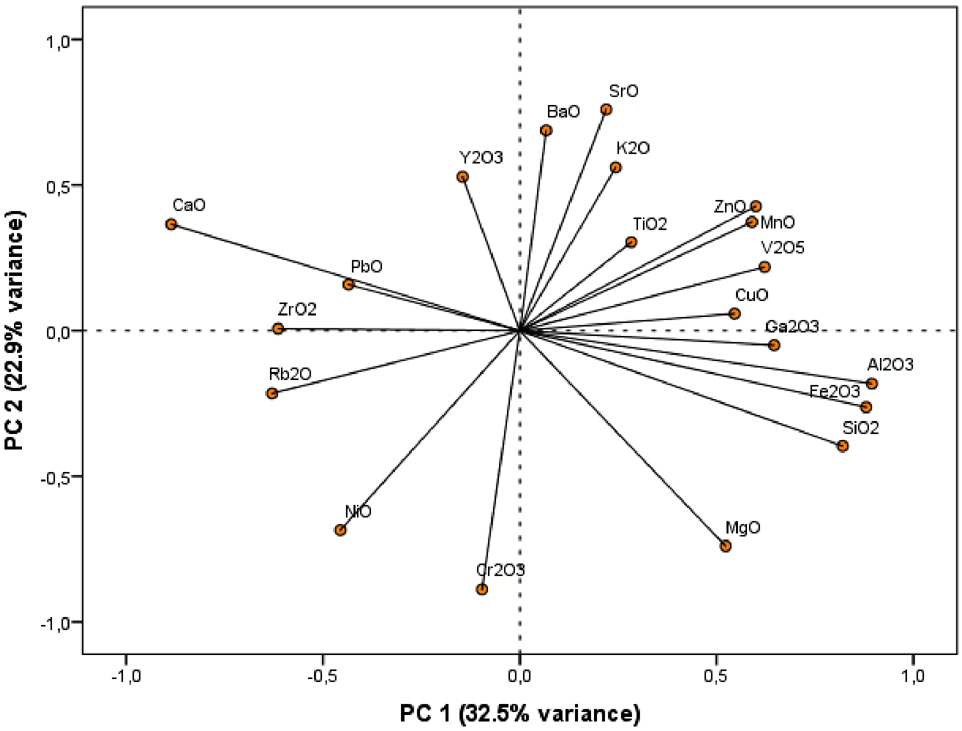


Figure III.28. The PCA component plot based on the ED-XRF dataset.

PCA was conducted using all measured compounds (**Figure III.28**), apart from sodium oxide, phosphorus pentoxide, sulphur trioxide, chlorine, cobalt and cerium oxides (Na_2O, P_2O_5, SO_3, ClO, Co_3O_4, CeO_2) for the reasons explained in Chapter II. The overall variation accounted for is 55.4%. Overall, there is a good correspondence between the petrographic and ED-XRF datasets. As expected, the mineralogically homogeneous fabric I creates a tighter chemical cluster than the other fabrics, while fabric IV is differentiated for being poorer in calcium oxide and richer in iron oxide than the other three fabrics (**Figures III.29** and **III.30**). As the mineralogical similarities between fabrics II and III have already denoted, there is a compositional overlap between the samples composing the two fabrics.

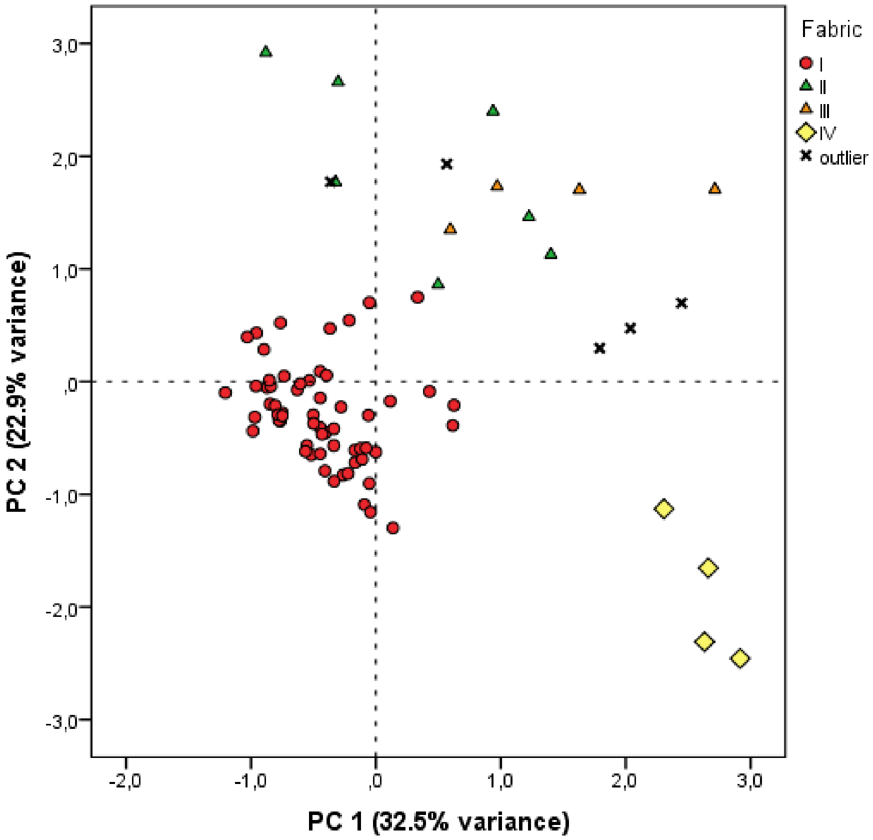


Figure III.29. PCA based on the chemical analysis of the Philia sample by ED-XRF. The samples are marked according to the fabric to which they were allocated by petrography.

In **Figure III.29**, there is a continuum and some overlap between fabrics II (with higher calcium oxide values) and III (with higher magnesia, silica, alumina and iron oxide values, see also **Figure III.28**). This compositional overlapping could be used as evidence to support the argument that the raw materials for the production of fabrics II and III were selected from different deposits, but from within the same geological region. This evidence could also be used to strengthen the argument that the raw materials for the production of fabric I belong to a different geological zone than the raw materials for the other three fabrics.

It seems that the majority of the Philia samples analysed with ED-XRF are made with a calcareous fabric, which is well above the conventional lower limit of 6% CaO for the characterisation of calcareous fabrics (Maniatis and Tite 1981). From the 80 samples analysed with ED-XRF, only two samples, RPP MA-5094 and RPP NAP-11, both made with fabric IV, have calcium oxide content lower than 6% (**Appendix III.3.a**).

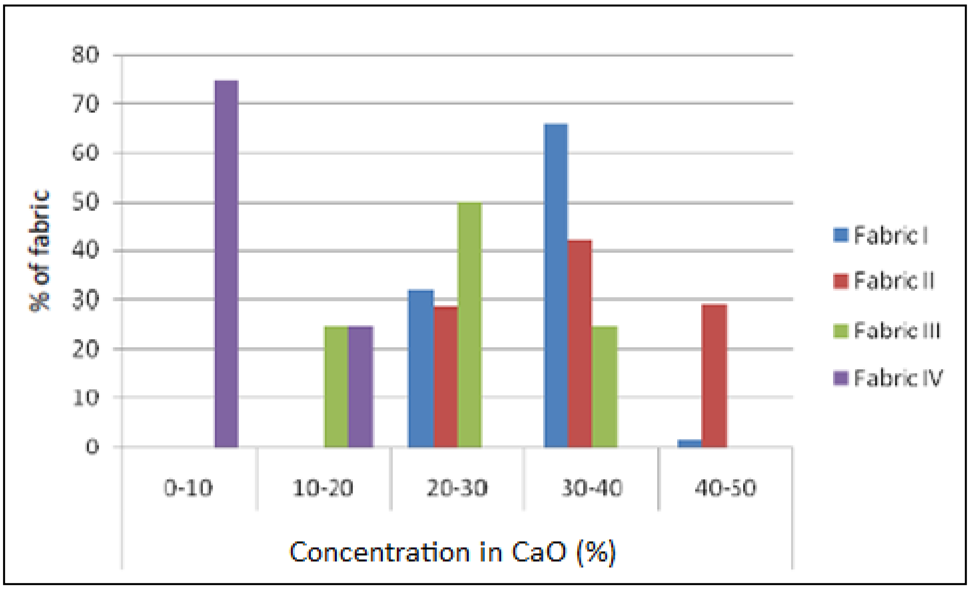


Figure III.30. The range of calcium oxide content in the composition of the RPP samples analysed with ED-XRF.

Figure III.30 shows how calcium oxide varies in the composition of the Philia samples, analysed with ED-XRF. It can be observed that 72 out of the 80 samples (90% of the RPP analysed sample) have high calcium oxide content, ranging between 20 and 50% in their composition. Moreover, **Figure III.31** shows that all of the samples allocated by petrography to fabric I fall within this range of 20-50%. It can also be noticed that fabric II is the most calcareous fabric, as the calcium oxide component in the composition of the samples composing fabric II in many cases goes above 40% (see also **Appendices III.3a** and **b**).

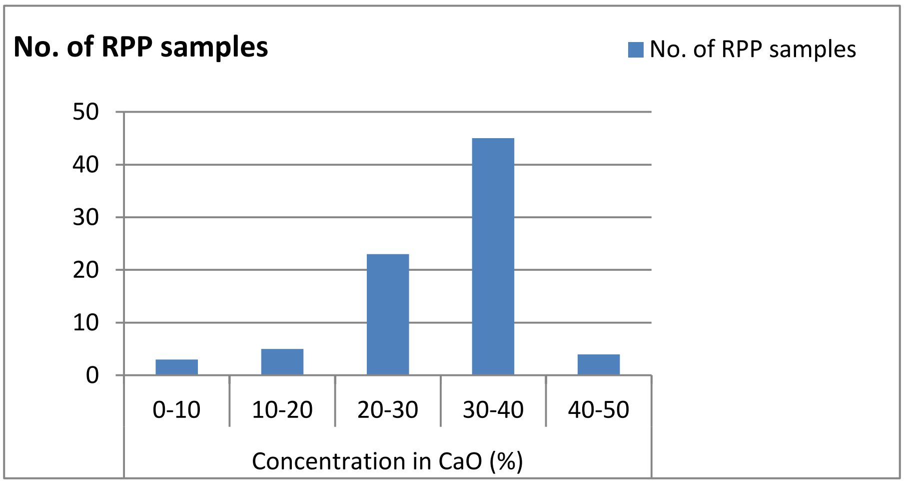


Figure III.31. The range of calcium oxide content in the composition of the RPP fabrics.

Figure III.32. In this photomicrograph of sample RPP MA-15337 (fabric I), the white, larger sub-angular inclusions are fragments of micritic limestone, mainly composed of calcite mineral. SEM-EDS analysis on one of these fragments has indicated that their elemental composition consists of 0.7% silica (SiO_2), 99.3% calcium oxide (CaO) (BSE, full scale: 300μm).

The high levels of calcium oxide in RPP samples can be mineralogically explained by the predominant presence of micritic limestone, calcite mineral and well-preserved microfossils in the composition of the samples. SEM-EDS analysis has shown that these individual inclusions are predominantly calciferous, with CaO[31] reaching 98% (**Figures III.32** and **II.33 a-b**).

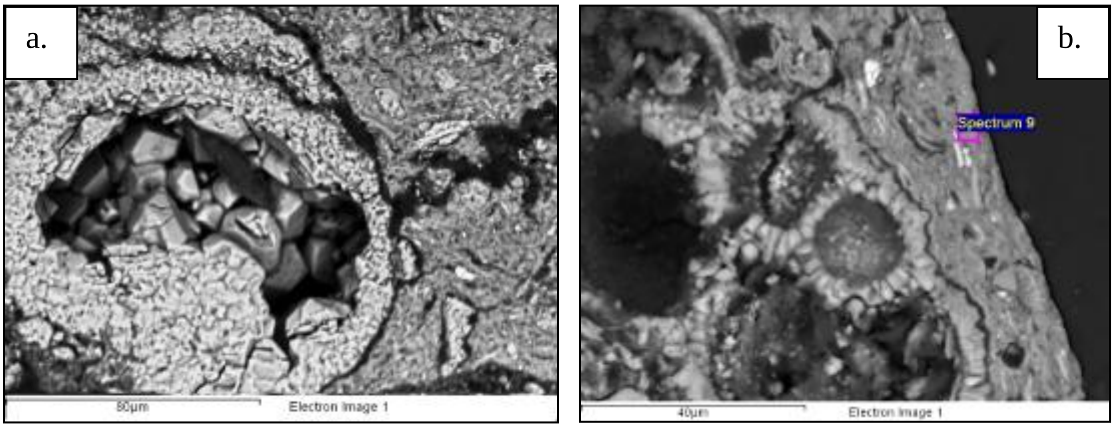


Figure III.33. RPP MA-16480 (fabric II) and RPP MA-15461 (outlier) are both calciferous. The first photomicrograph of RPP MA-16480 (**a**) shows a rounded fragment of micritic limestone, of which the individual calcite crystals are visible, whereas in the second photomicrograph of RPP MA-15641 the calcified shells of microfossils are visible. The presence of these inclusions adds to the overall CaO in the chemical composition of these samples (BSE, full scale 60 μm (**a**) and 40 μm (**b**).

[31] It should be noted that SEM-EDS does not analyse carbon or oxygen, therefore the values are given in CaO and not $CaCO_3$.

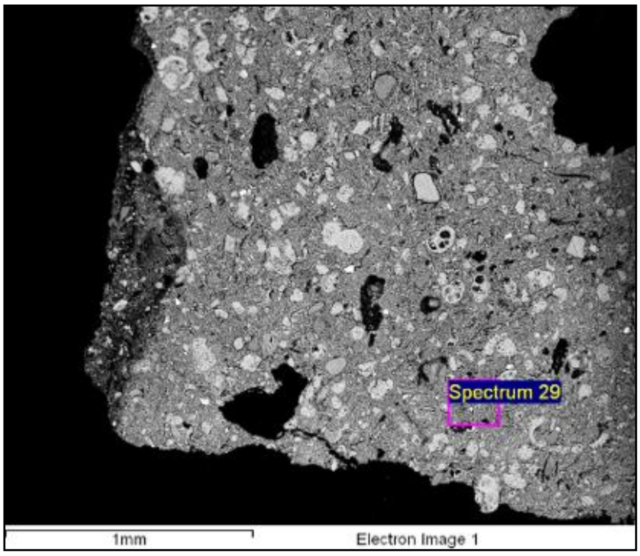


Figure III.34. RPP MA-13085 (fabric II) is rich in calcite-filled microfossils and micritic limestone fragments. SEM-EDS analysis focused on the clay matrix has indicated that the clay used for the production of the corresponding vessel reaches 34.3% in calcium oxide. Other compounds present include 0.9% soda (Na_2O), 2.9% magnesia (MgO), 11.3% alumina (Al_2O_3), 43.7% silica (SiO_2), 1.7% potash (K_2O) and 5.1% iron oxide (FeO) (BSE, full scale: 1mm).

In addition to the various carbonaceous inclusions, the clay matrices of these samples also present high consistency in calcium oxide. The SEM-EDS analyses of bulk areas in the Philia samples under study has indicated that the clay used for the production of the corresponding vessels reaches 35% in calcium oxide (**Figures III.34** and **III.35 a-b**). Finally, it seems that even the tcfs occurring in fabric I also present high concentrations of calcium oxide, contributing to the overall high presence of calcium oxide in fabric I (**Figures III.36**).

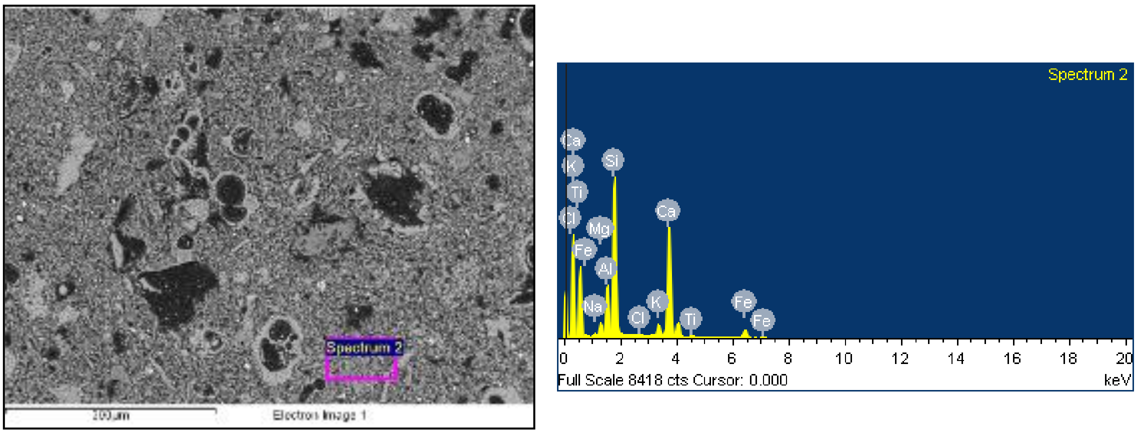


Figure III.35. RPP MA-15461 has not only calciferous inclusions, including many well-preserved microfossils, but also a calcium-oxide rich clay matrix. The spectrum of analysis shows the high quantity of CaO in the composition of this sample's clay matrix (BSE, full scale: 300μm).

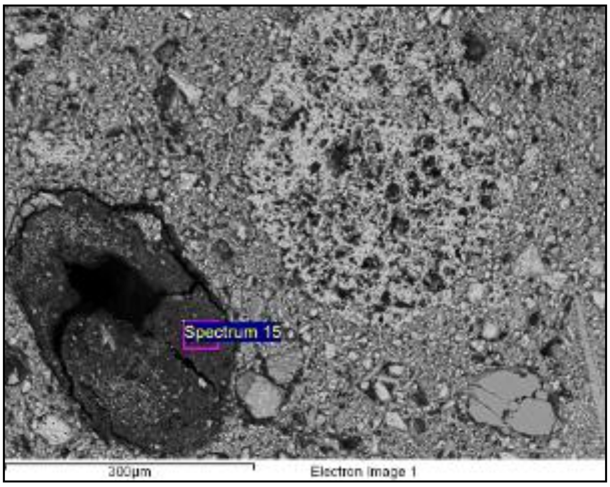


Figure III.36. The presence of tcfs contributes to the overall high occurrence of CaO in fabric I. In RPP MA-15377, SEM-EDS has indicated that tcfs contains over 20% of CaO (BSE, full scale: 300 μm).

In addition to the high levels of iron oxide (**Figure III.37**), the samples forming fabric group IV are also the richest in silica and alumina (**Figure III.38**). Mineralogically, the low consistency of CaO and the high concentration in Fe_2O_3 is interpreted by the restricted presence of carbonaceous material and the predominant presence of igneous rocks such as basalts, and igneous rock-forming minerals such as biotite mica and pyroxene, the chemical composition of which is characterised by the presence of Fe_2O_3 (Best 2006, 21-23, 657-658; Cox *et al.* 1988, 137, 153; **Figures III.24** and **III.27**). The high levels of silica in the composition of the samples composing fabric group IV can be explained mineralogically by the frequent presence of monocrystalline quartz and the common presence of polycrystalline quartz in the clay matrices of these samples. The overall igneous character of the samples made with fabric IV explains well the high levels of silica, as SiO_2 is a characteristic compound in the igneous rocks' chemical make-up and it is actually used for classifying them into different groups (Rothery 2003, 240).

Aluminum is an element which forms part of the chemical composition of biotite mica, which is so prominently present in fabric IV (**Figure III.24**). Looking at the chemical composition of biotite, $K(Mg,Fe)_3AlSi_3O_{10}(OH)_2$, (Rothery 2003, 233), it is also understood why the samples made with fabric IV are also characterised by the highest concentrations in MgO (**Figure III.39**). The ceramic matrix itself can also be rich in magnesia (see clay matrix composition in **Figure III.34**)

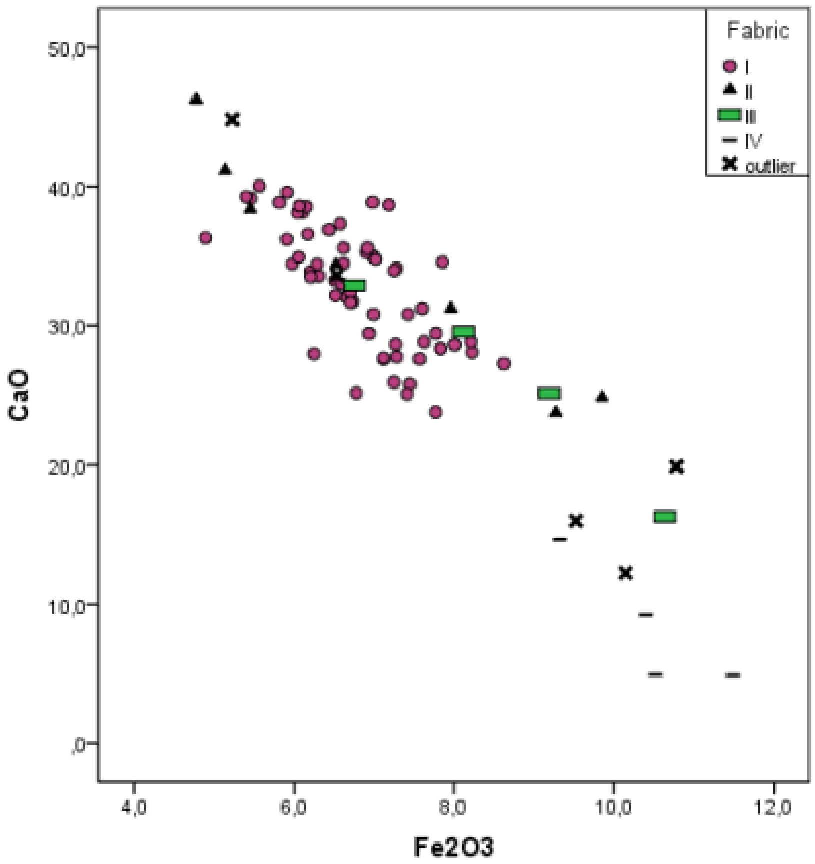


Figure III.37. Simple scatterplot based on the ED-XRF measurements of calcium and iron oxides in the composition of the RPP samples.

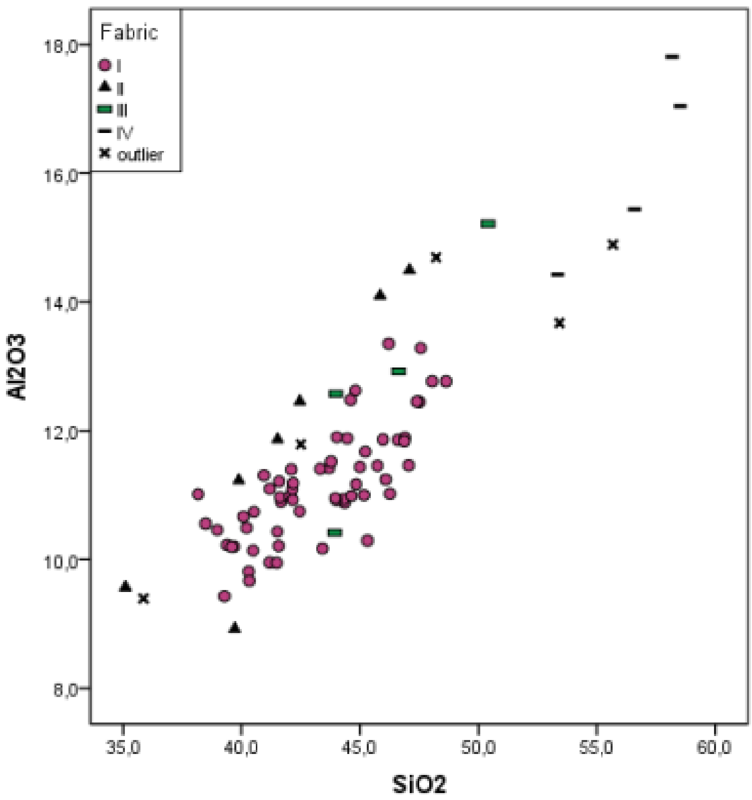


Figure III.38. Simple scatterplot based on the ED-XRF measurements of silica and alumina in the composition of the analysed RPP samples.

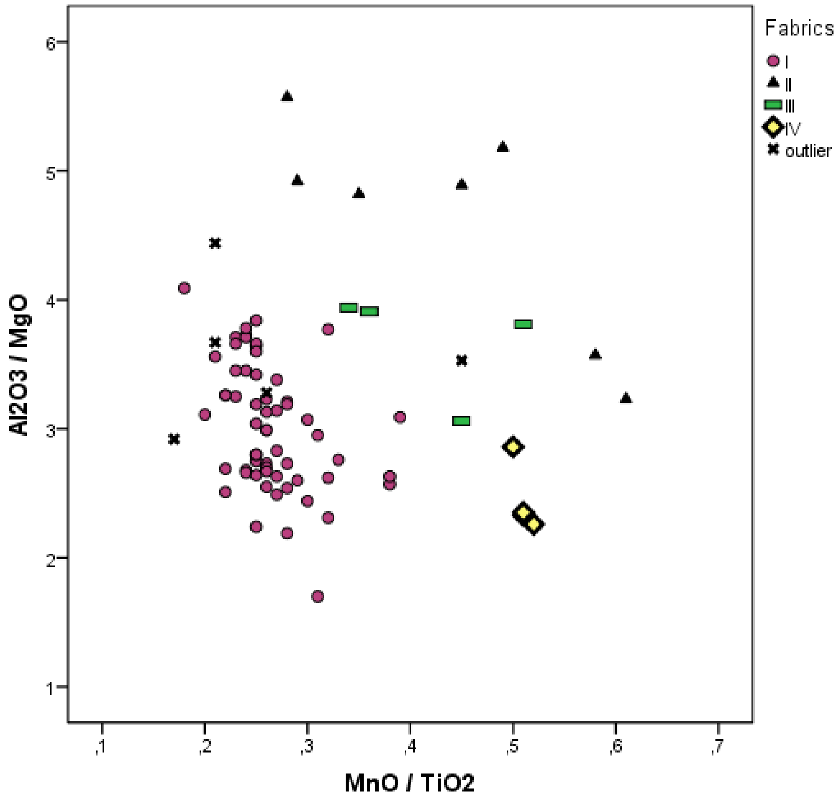


Figure III.39. Simple scatterplot based on the ED-XRF measurements of alumina/magnesia and manganese/titania in the composition of the analysed RPP samples.

It is evident that whatever combination of main element compounds used (e.g. **Figure III.39**), the samples composing fabrics I, III and IV – as defined by petrography – generate relatively well-defined chemical clusters, whereas the samples allocated by petrography to fabric II are more scattered. The tighter chemical and mineralogical clusters representing fabrics I, III and IV, in contrast to the degree of compositional variation within fabric II, raises specific questions relating to the selective and repetitive use of raw material resources and the degree of standardisation in the selection and processing of the raw materials for ceramic production.

Another interesting aspect is the fact that fabric I is used for the production of vessels coming from all the different Philia sites included in the project. **Figure III.40** (considered in association with **Figure III.28**) shows that all samples from the sites of Kissonerga *Mosphilia* and *Skalia*, Philia *Vasiliko* and *Laksia tou Kasinou* and Vasilia *Kylistra* are chemically very similar. On the other hand, the samples from Marki are more widely distributed on the plot. Some of the Marki samples are situated within the heart of this principal cluster, and others are scattered wider, creating other chemical clusters. Some variation also exists within the samples coming from Nicosia *Ayia Paraskevi* and Kyra *Alonia*.

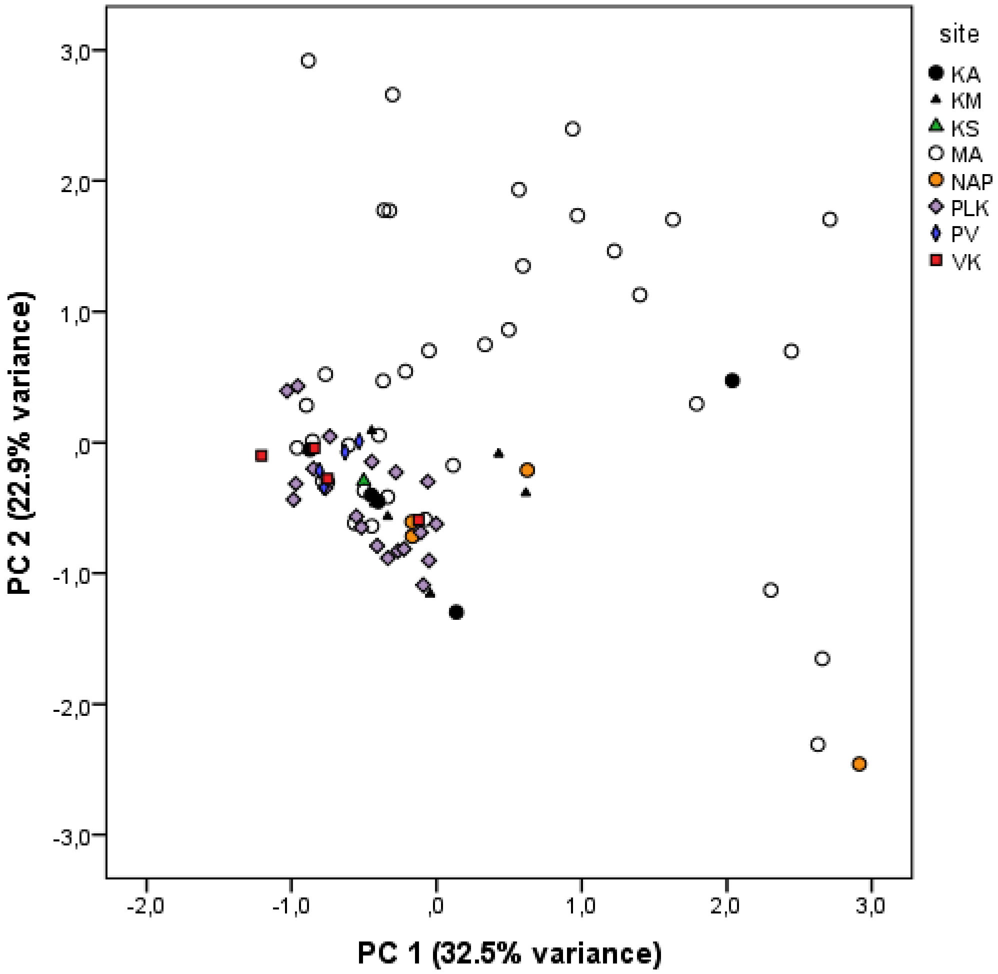


Figure III.40. PCA based on the chemical analysis of the RPP sample by ED-XRF. The samples are marked according to the site of their discovery.

In addition to a wide variety of sites, fabric I also covers different styles. **Figure III.41** shows that there is no evident association between a particular fabric and a stylistic form and that more than one production centres were producing similar ceramic styles. However, it is interesting to investigate whether there are any differences in the techniques and quality of stylistic execution among the different production centres and their degree of standardisation within each chemical and mineralogical cluster. The results of this investigation will be presented in the last section of this chapter, where observations made during the macroscopic study of the Philia sample are combined with the analytical results.

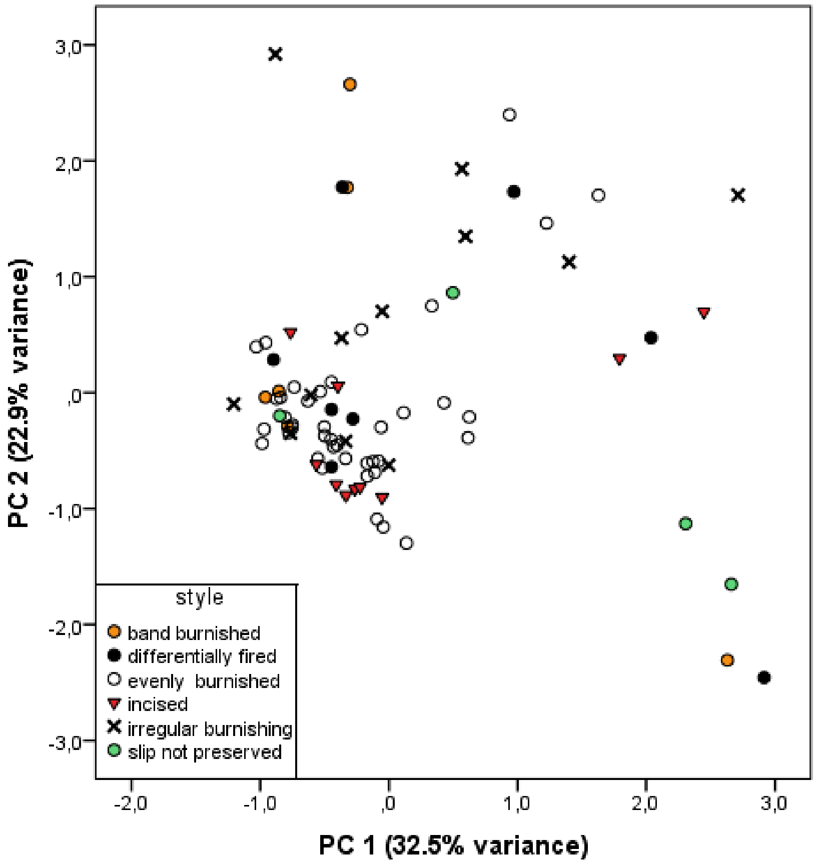


Figure III.41. PCA based on the chemical analysis of the RPP sample by ED-XRF. The samples are marked according to their stylistic attributes.

The chemical assessment of the RPP sample under study has indicated that there is a general preference for calcareous clays in the production of this ware. Only one sample cluster is chemically more diverse from the others, with lower calcium oxide content and higher silica, iron oxide, alumina and magnesia contents. This chemical cluster corresponds to fabric IV, as defined petrographically, an igneous fabric, very different from the rest of the sedimentary fabrics.

On the other hand, within the wider range of calcareous fabrics, fabric I is differentiated from fabrics II and III, not only due to its distinct metamorphic characteristics, in contrast to the igneous components characterising fabrics II and III, but also due to its compositional consistency reflected in the relatively tight chemical cluster that the samples made with fabric I create. Both fabrics I and IV seem to be compositionally more uniform in comparison with fabrics II and III, this compositional uniformity being the result of a similar processing of clays from a range of sources, or the result of a systematic use of the same clay resources.

III.3.c. A technological study of ceramic slips

SEM-EDS microanalysis was primarily used for the chemical characterisation of RPP slip layers (**Appendix III.4**). The SEM photomicrographs and SEM-EDS chemical analysis showed that there is an exclusive use of refined, non-calcareous, iron rich clays for the production of these distinct red slips (**Figure III.42).** Comparisons between elemental datasets have further indicated that different materials were used for the production of the slips and ceramic bodies. **Figures III.43 - III.45** show that there are significant differences in all tested main elements between the two categories of analysed ceramic areas.

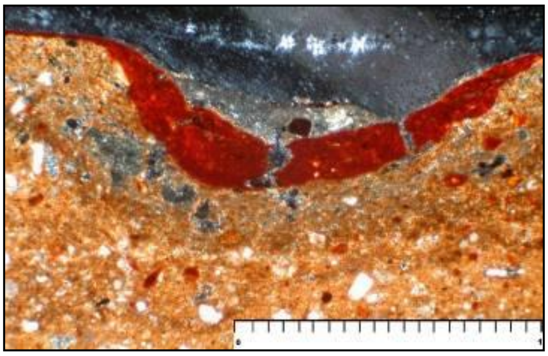


Figure III.42. The distinct red-coloured coating visible in the photomicrograph of RPP PLK-26 is part of the slip layer as seen in thin section under the optical microscope. In specific, the slip has filled the incision made prior to slip application (XP, full scale: 1mm).

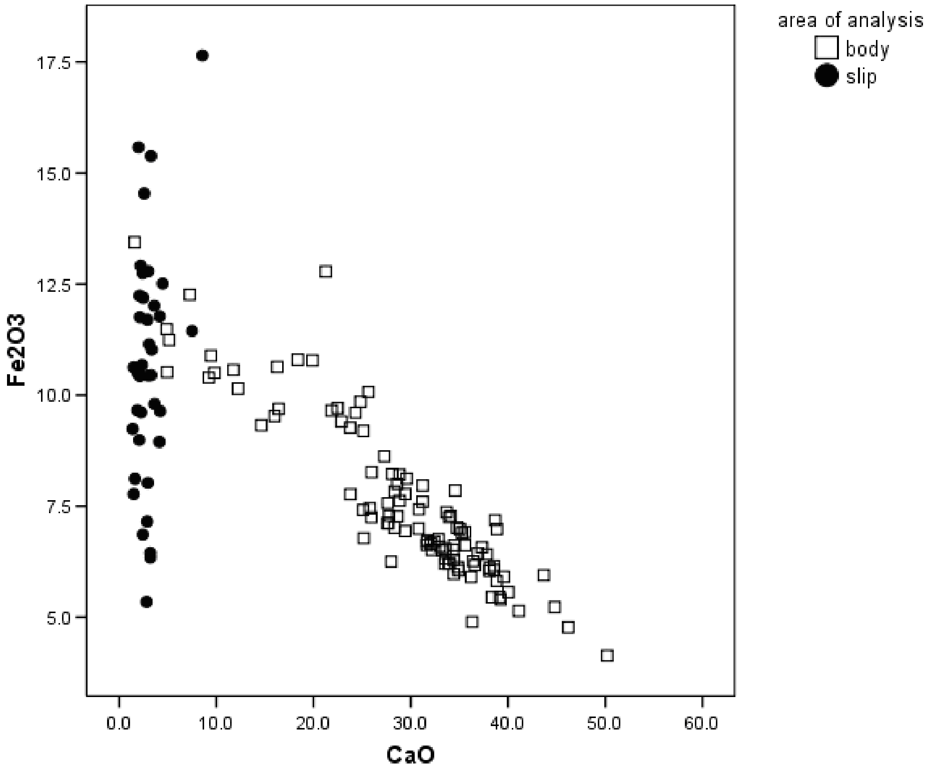


Figure III.43. Bivariate scatterplot showing the concentrations of calcium (CaO) and iron (Fe_2O_3) oxides in the composition of RPP ceramic slips and bodies.

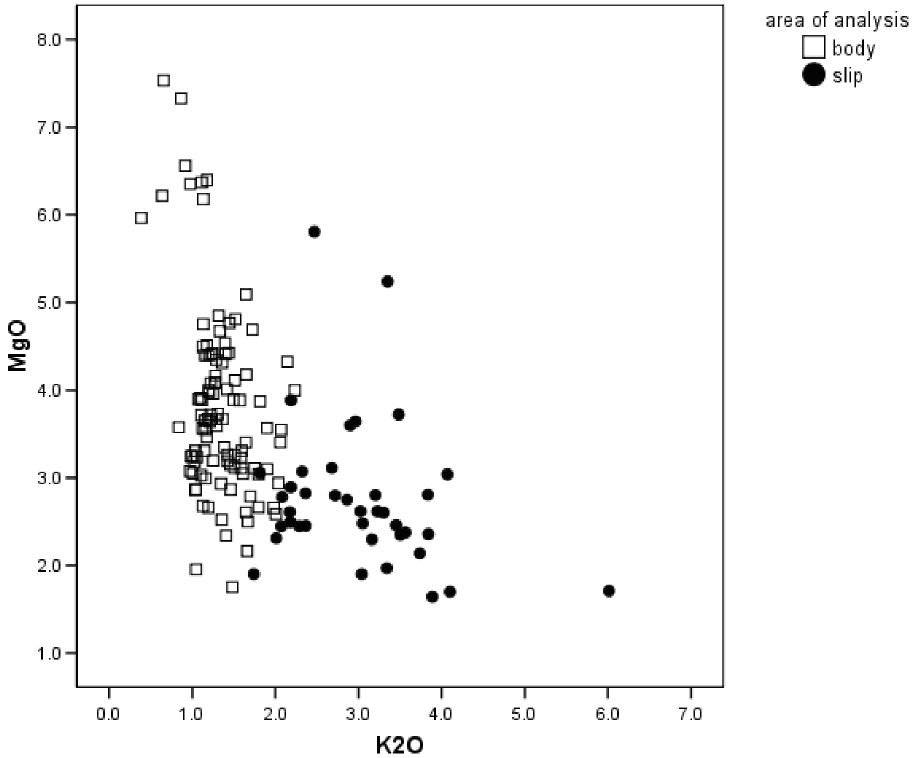


Figure III.44. Bivariate scatterplot showing the concentrations of potash (K_2O) and magnesia (MgO) in the composition of RPP ceramic slips and bodies.

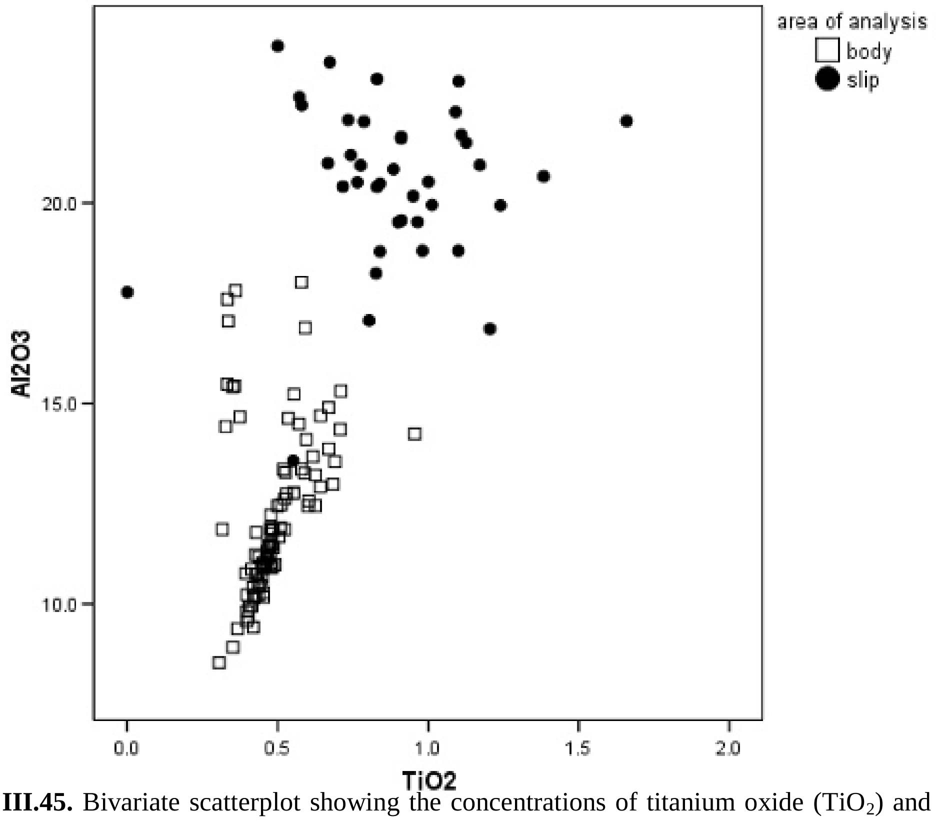


Figure III.45. Bivariate scatterplot showing the concentrations of titanium oxide (TiO_2) and alumina (Al_2O_3) in the composition of RPP ceramic slips and bodies.

As **Figure III.43** (also **Appendix III.4**) shows, iron oxide oscillates between 8 and 11 per cent in the composition of most RPP slips, whereas calcium oxide remains systematically below 3%. As **Figures III.44** and **III.45** also show, there are higher concentrations of potash and alumina in the composition of ceramic slips than of ceramic bodies, which range between 2-4 and 19-23 per cent respectively.

Looking at the aforementioned scatterplots, it is interesting to notice that in contrast to the close chemical clusters created by the ceramic body measurements, slip measurements are more widely dispersed on the plots, creating only small clusters of one to three samples at most. This observation shows that raw material resources for the production of ceramic bodies are used in more standardised ways than those for the production of ceramic slips. Accordingly, while there is an obvious preference for ferrous, non-calcareous clays for the fabrication of ceramic slips, it seems that different types of ferrous, non-calcareous clays could serve the Philia potters' requirements without necessarily exploiting systematically the same clay resources. The study of the RPP samples' microstructure and composition showed that the Philia potters were familiar with the properties of various types of clays, and that their technological choices were firmly in accord with them.

Considering the results of this study in association with the outcomes of earlier works on RP slips (*eg.* Barlow and Idziak 1989; Barlow 1996; Dikomitou 2007), it is argued that the recipe for the production of slip layers remained unchanged from the Philia phase until the end of the MC period, in other words during the entire lifespan of the RPP/RP tradition. What essentially changed was the working of the slip after its application on the surface of the pots, as reflected in the differing degrees of lustre and thickness, and colour differences observed on RPP and RP vessels. These stylistic variations are either regional or temporal, or both.

It is worth considering comparatively the preparation processes followed for the production of the RPP clay bodies and slips. The size of the inclusions in the fabrics used for the production of the RPP bodies (section III.3.a) suggests that little attention was paid to the preparation of the clay for the production of the vessels' bodies, hand picking the largest inclusions visible to the naked eye being the primary method of clay purification. On the contrary, the fineness of the slip layer (e.g. **Figure III.46**) on all RPP vessels indicates that the Philia potters had already mastered the art of thorough clay refinement.

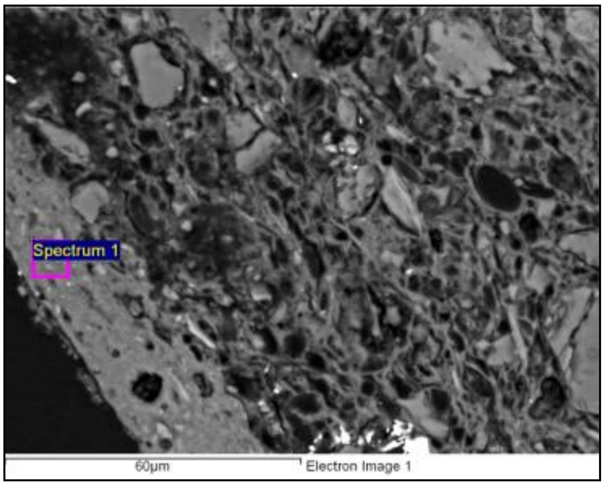


Figure III.46. The fineness of the ceramic slip layer of RPP NAP-8, in contrast to the sample's ceramic body (BSE, full scale: 60 μm).

The Philia potters had the knowledge to selectively and exclusively use non-calcareous clays rich in iron oxides and structural iron, refine them to a specific particle size and fire them in controlled firing conditions, in order to produce this red slip. According to R. E Jones, the size of the clay particles also plays a significant role in this process (Jones 1986, 752). Therefore, pre-treatment was required as part of the production process, and could involve the purification of the clay and its grinding to powder (Jones 1986, 760). The suggested procedure explains the fineness of the slip layer in comparison to the texture of the vessel body (**Figure III.46**).

After its purification, the clay was ground into powder, and then it was suspended in water, and applied to the vessel surface using a cloth or a brush. After drying and before firing, the potter would polish or burnish the slipped surface, an act which would force or compact the slip particles into the pores of the vessel wall, achieving a more compact and permanent surface, as well as a brighter and more lustrous appearance (Jones 1986, 761). The effect of polishing can be macroscopically observed on most of the RPP and later RP surfaces, justifying the names of these wares.

Overall, the statistical comparison of SEM-EDS measurements taken from the RPP slips indicates that there is no relation between the chemical composition of these slips, the corresponding ware, fabric group or samples' site of recovery. What this study suggests is that while the Philia potters used non-calcareous, ferrous clays for ceramic slips to be applied on different stylistic classes of pottery, they were not systematically using any specific resources for the acquisition of the necessary raw materials.

III.3.d. A technological study of firing temperatures

Petrographic and macroscopic data tend to agree that RPP pottery was fired in relatively low temperatures. In particular, the incomplete carbonisation of organic matter in voids and the presence of unoxidised blackened areas, especially in the core of the sections, indicate that either the RPP vessels were fired in low temperatures or that high firing temperatures did not last for a long period of time. For that reason, neither the organic matter was burnt nor were the vessels' walls thoroughly oxidised. Furthermore, high magnification images of cross sections of various RPP samples show a striking absence of any degree of vitrification, suggesting that firing temperatures did not surpass 750-800 ºC (Maniatis and Tite 1981, 61). **Figures III.47-51** document that no clay particle vitrification is observed in any of the analysed RPP samples, from all sites, suggesting that similar firing techniques were in use across the island in different workshops. Moreover, the intact presence of fossil shells, without any signs of damage in their carbonaceous parts[32], also strengthens the argument that the firing temperatures remained relatively low throughout the course of firing (**Figure III.52**).

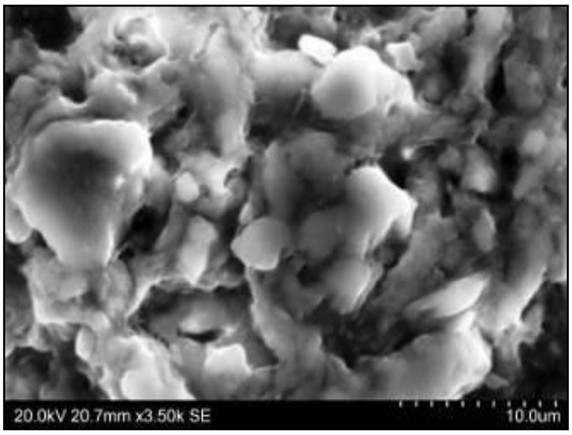


Figure III.47. High magnification image of sample RPP KA-5 (SE, full scale: 10 um).

[32] Calcite mineral decomposes on firing between 650ºC and 900ºC (Rice 1987, 98). The exact temperature at which calcite decomposition takes place is a matter of dispute among researchers. Some of them place it at as low as 650-750ºC (Rice 1987, 98). However it should be highlighted that in addition to the temperature, firing time and atmosphere are also important factors affecting thermal behaviour (Rice 1987, 98). When calcite decomposes, it forms lime and carbon dioxide gas (CaO and CO_2, Rice 1987, 98)

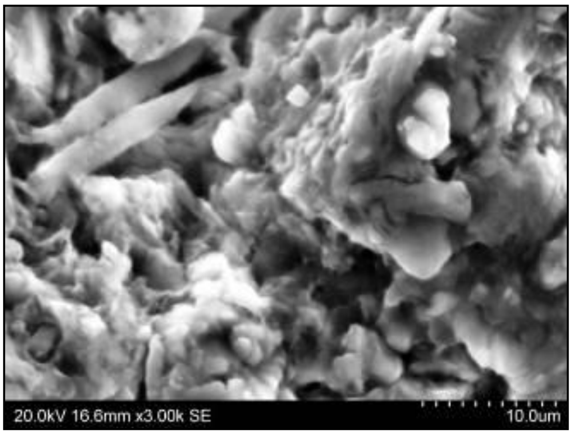


Figure III.48. High magnification image of sample RPP VK-17 (SE, full scale: 10 um).

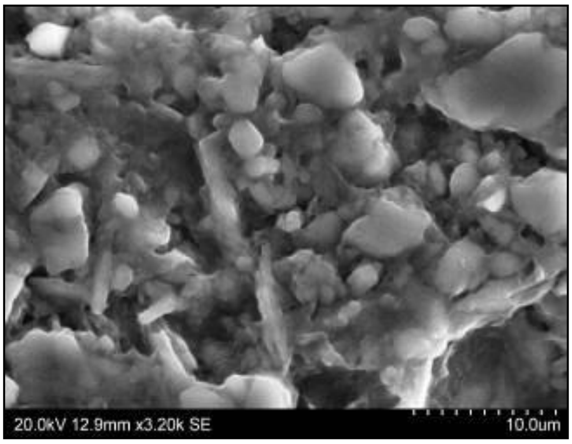


Figure III.49. High magnification image of sample RPP PLK-44 (SE, full scale: 50 um).

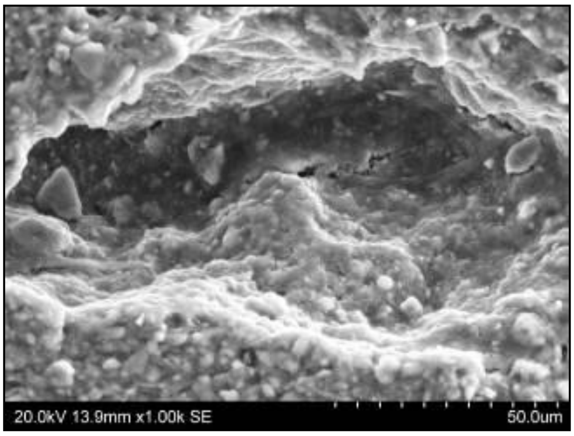


Figure III.50. High magnification image of sample RPP PV-47 (SE, full scale: 10 um).

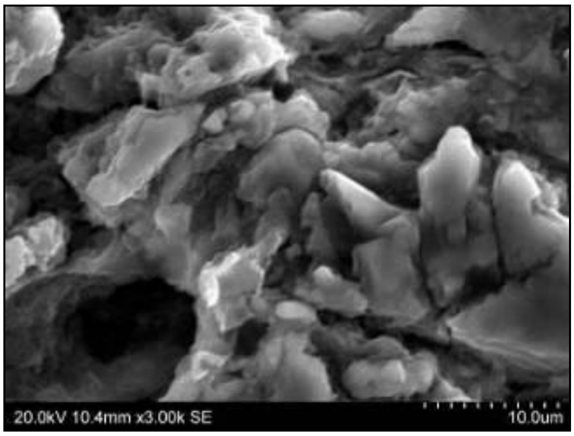


Figure III.51. High magnification image of sample RPP KM-56 (SE, full scale: 10 um).

Figure III.52. High magnification image showing the preservation of microfossils in RPP MA-7427 (BSE, full scale: 100μm).

These arguments are in accordance with the general belief that Cypriot Bronze Age potters were firing without kilns, using open firing or bonfires. Shorter firing also seems effective for coarser-textured fabrics like those worked during the early stages of the Cypriot Bronze Age, which are less vulnerable to thermal shock (Rice 1987, 156). The potters could use the vivid red colour of the applied slips to determine when the firing was complete (Rice 1987, 157-158). If this was indeed the case, then the fire was put out as soon as the surfaces of the vessels obtained their characteristic red lustre, but before the cores of the vessels' walls were oxidised, or before the organic matter present in the clay matrices was thoroughly burnt.

III.4. A short note on the geology of Cyprus.

Cyprus is divided into four different geological zones. These are the zone of Kyrenia in the north, the Troodos ophiolite in the heart of the island, partially encircled by a zone of more recent sediments, which expand from the north to the southern part of the island bridging the two mountain ranges, and finally the Mamonia complex zone in south-western Cyprus (**Figure IV.53**; Constantinou 2002).

Figure III.53. The division of Cyprus into four geological zones (map by the Department of Geological Surveys, 2005-2010).

In the heart of the island, the Troodos Ophiolite or the Troodos Zone constitutes the geological core of Cyprus. It is regarded as the most thoroughly studied ophiolite in the world (Department of Geological Surveys 2011). The Troodos Ophiolite consists of plutonics (serpentine, dunite, pyroxenite, gabbro and plagiogranites), intrusive (basalts and dolerites), volcanic (pillow lavas and lava flows, mainly of basaltic composition) and chemical sediments (first sediments deposited over the ophiolite rocks as a result of hydrothermal activity; Department of Geological Surveys 2011; also Constantinou 2002; Pantazi 1973).

The Troodos Ophiolite plays a very significant role in the water resources of the island. Most of the Troodos' rocks, such as the gabbros, are good aquifers, water-bearing permeable rocks, thus the perennial rivers feed them in the periphery of the Troodos and the plains. The Troodos' different geological contexts are traversed by the numerous rivers which derive from the Troodos massif and move towards the sedimentary deposits of the valleys, creating alluvia that seem to have been widely exploited for the production of pottery. For that reason, and considering that many of the EC and MC sites known to exist are located around the foothills of the Troodos mountain range (**Figure I.1**), and surrounded by similar geological environments, it would not be groundless to argue that contemporary potters across the island had at their disposal similar raw material resources, making modern analytical attempts at provenancing very difficult.

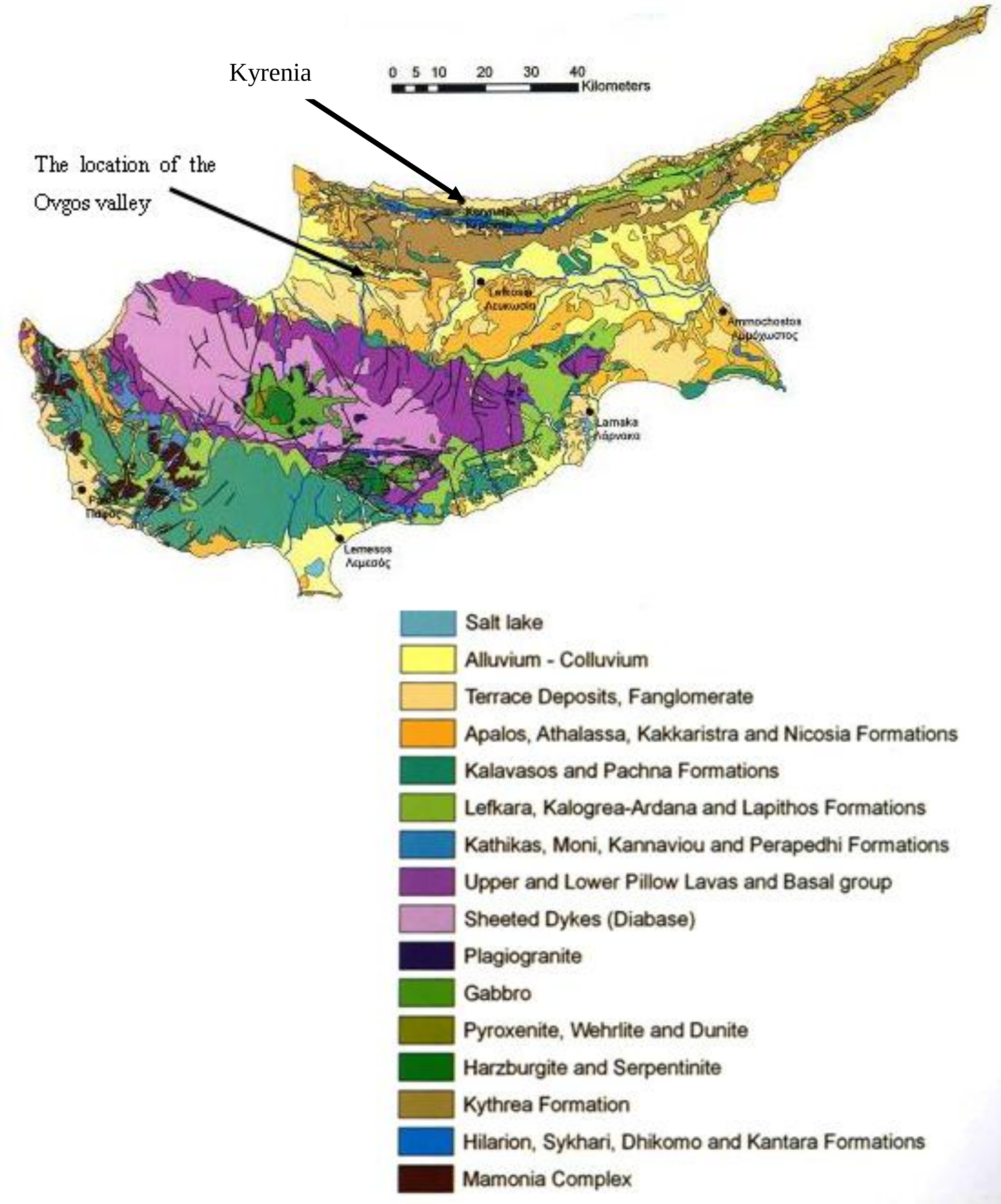


Figure III.54. Geological map of Cyprus showing main geological regions on the island (Department of Geological Surveys, Republic of Cyprus, http://www.moa.gov.cy/moa/gsd/gsd.nsf/dmlIndex_en/).

The northern-most geological zone of Cyprus, the Kyrenia zone (**Figure III.54**), is a complex assemblage of sedimentary, and limited metamorphic and igneous rocks. This geological zone predominantly consists of carbonate masses, in particular limestones, as well as marls and chalks and cherts (Ducloz 1972; Constantinou 2002). The Zone of the autochthonous sedimentary rocks extends between the Troodos and Kyrenia geological zones, as well as the southern part of the island. It consists of bentonitic clays, volcaniclastics, melange, marls, chalks, cherts, limestones, calcarenites, evaporites and clastic sediments (Constantinou 2002). Finally, the fourth geological zone, restricted to the southwest of the island, the Mamonia complex, constitutes another diverse and structurally complex assemblage of igneous, sedimentary and metamorphic rocks, including volcanic, limestones, mudstones and quartzitic sandstones, schists and marbles (Constantinou 2002).

It should be noted that despite the numerous and detailed studies on the geology of the island, and the strong interest over the years by the international research community in the geology of Cyprus, pin-pointing the provenance of ceramic samples is neither a simple nor a straight-forward procedure. On the contrary, the division of the island into geological formations (**Figure III.54**), the repetitive presence of complex assemblages in almost all geological zones consisting of sedimentary, igneous and metamorphic rocks, and most importantly the presence of a similar geology encircling the Troodos mountain range at the centre of the island, make any attempt at provenancing the ceramic material under study extremely difficult and in many cases impossible.

III.5. RPP pottery. A story based on figures and numbers.

An overview of the aforementioned physicochemical study on RPP pottery has indicated that there are at least four different fabrics comprising the analysed Philia sample, and even so, the number of outliers suggests that the Philia fabric variability must have been even greater (**Table III.2**, **Figure III.29**). From the four fabrics identified using petrographic analysis, three fabrics are characterised by calcareous clays, probably natural blends procured from alluvial deposits by riverbeds (**Figure III.31**). Calcareous fabrics dominate also among the outliers. This systematic preference for calcareous clays is supported by ED-XRF analysis, which showed that only two out of the 80 samples, chemically studied, are non-calcareous, having calcium contents below the set limit of 6% (**Figures III.30 - III.31**).

A common recipe was used for the production of all fabrics, which includes the use of fine clays, vegetal temper, and low firing temperatures, which did not exceed 750-800ºC. There are no indications of intentional mineral or rock tempering, nor any evidence for detailed clay refinement procedures. On the other hand, the clays used for the production of the ceramic slips are in almost all cases non-calcareous, iron-rich, and well-refined. These observations apply for all samples from all sites, and made with different fabrics.

The physiochemical study of RPP pottery has shown that there is no patterned association between a specific fabric and a specific site, or a specific fabric and a particular stylistic attribute (**Table III.2**, **Figures III.41** and **III.42**). Nonetheless, the mineralogical and chemical analyses have shown that there is one fabric, namely fabric I, of which the scale of production is evidently greater than that of any other fabric. As has already been mentioned, 75% of the entire analysed RPP sample, from all sites, is made with fabric I (**Table III.2**).

The mineralogical identification of fabric I is one of the most significant outcomes of this research project. This is the broadest fabric group identified, including RPP samples from Vasilia in the north, Marki and *Ayia Paraskevi* at the centre, to Kissonerga in the southwest. Fabric I is a calcareous fabric, for the production of which the established RPP recipe is followed, but which is however differentiated from the other identified fabrics due to the prominent presence of metamorphic rocks and the very restricted presence of igneous inclusions, indications that the location of raw material resources was not in the vicinity of the Troodos pillow lavas.

The rare igneous inclusions in fabric I can be conceived as remnants of the natural intermixing of materials in the course of the flow of rivers across geological zones. Igneous materials essentially characterise the central geological terrain, where the Troodos ophiolite complex dominates, however, as has already been explained in the preceding section, a limited presence of igneous rocks occurs in the otherwise carbonate-dominated northern geological environment. Most importantly, fabric I is characterised by a distinct presence of chert and other quartzitic inclusions, which are not found in any of the remaining fabrics. This compositional uniformity of fabric I suggests that the raw materials for its production were collected from a specific geological region, which was either small and/or very uniform, resulting in a tighter compositional group than the other fabrics represented in the sample.

It is impossible at present to determine the number and size of production centres that produced RPP fabric I, or confidently pinpoint the provenance of fabric I, as there is no relevant information for calibrating this fabric's uniformity (or diversity) against Cyprus' various geological zones. Such an act requires detailed geochemical information coming from the entire island, which is currently not available. However, the unprecedented compositional uniformity of fabric I and its recovery at different sites across the island at least allows the argument that this RPP fabric likely represents production at one or more centres within a specific, relatively undifferentiated geological area, and that it was then distributed across Cyprus.

Fabrics II, III and IV share a common characteristic: as indicated by petrography, they all have igneous components in their composition. All of them contain some kind of igneous materials, mainly in the form of basalts. The presence of igneous components in the composition of fabrics II, III and IV and in some of the outliers, suggests that the raw materials for the production of all these fabrics, and corresponding vessels, were collected from the vicinity of the Troodos pillow lavas, where basalts are the most common rocks. This argument is important in understanding the extent of ceramic distribution in the central and southern parts of the island, and also appreciating the scale of ceramic production or exchange at a local and regional level.

Particularly the pottery made with fabric IV deviates substantially from the standard Philia ceramic tradition, which includes primarily the use of calcareous clays from sedimentary deposits. Petrographic analysis has indicated that 4.5% of the entire RPP sample under study is made with this very distinct and differing fabric IV, with minimum presence of any sedimentary components (**Table III.2**, **Figures III.24-III.27**). The raw materials for this fabric were sought and collected from a different geological environment than the one exploited for the collection of raw materials for the production of fabrics I, II and III. Moreover, different techniques and skills are required for the manipulation of these igneous materials and their processing, forming into pots, finishing and firing, since there are differences between the properties of calcareous and non-calcareous fabrics (e.g. degree of plasticity, hardness, shrinkage).

Table III.3 is indicative of the island-wide distribution of fabric I and the more restricted presence of fabrics II, III and IV, which according to this table seem to have been used only at Marki or the region surrounding Marki. It is possible that the compositional diversity characterising the Marki sample in comparison with the exclusive presence of fabric I in most of the other site samples, results from sampling biases due to the small RPP assemblages coming, with the exception of the Kissonerga samples, exclusively from tombs favouring vessels made with fabric I, in comparison to the currently unique large RPP sample coming from the settlement at Marki, which reveals more RPP fabrics.

This argument is further supported by the petrographic analysis conducted by Robertson on RPP samples coming from Kissonerga. According to Robertson's analytical results (1989), the Kissonerga samples are essentially divided into two clusters, very homogeneous within their own groupings, but different between them. The members of the first group

> "are basically similar, composed of a very unusual mixture of sedimentary, igneous and metamorphic rocks. The most likely source is a river bed containing alluvium mixing very local sources (coarser) with finer grained material (chalk) derived from outcrops further north. The remaining Kissonerga samples form a distinct group in that all comprise very angular, poorly sorted material, with each sherd differing in detail; each has an unusually large amount of igneous derived grains; basalt, gabbro and serpentinite; a local origin from a stream bed seems possible […]" (Robertson 1989[33]).

According to Robertson's descriptions of the two fabrics, it seems that the first fabric is much more standardised than the second one, and corresponds, considering its mineralogical characteristics, to fabric I as defined by the present study, while the second one could correspond to a local or a regional variant, just like in the case of Marki with fabrics II, III and IV. Therefore, both case studies involving RPP material coming from settlements tend to support the argument that the variability in RPP fabrics represents two different networks of RPP production and distribution, the one being the island-wide network circulating fabric I, and the other, the more restricted networks, as seen in the remaining fabrics from Marki and Kissonerga, circulating pottery at a more local and/or regional level. If we take into consideration the similar pictures that the petrographic analyses at Marki and Kissonerga have produced, it may be that a comparable two-level pottery production and distribution system was the norm at other contemporaneous Philia settlements. That is why the Marki case is treated as representative of smaller settlements sites and becomes this thesis' research focus.

Table III.3 indicates that 51% of the Marki RPP sample is made with fabric I, while the remaining 49% is made with other fabrics, among which one or more are

[33] Unpublished report by courtesy of Prof. A.H.F Robertson, School of Geosciences, University of Edinburgh and the Lemba Archaeological Project, Paphos, Cyprus.

bound to be locally produced or imported from the surrounding Marki region. Likewise, while other small sites like Marki produced some of their pottery locally, they also largely imported pottery from other regional neighbouring centres, and, as **Table III.3** indicates, also pottery made with fabric I.

Fabric Group	Site	Ware	No. of samples	% of site sample
I	KA	RPP	5	83%
	NAP	RPP	4	67%
	VK	RPP	5	100%
	PLK and PV	RPP	25	100%
	KM	RPP	6	100%
	KS	RPP	1	100%
	MA	RPP	20	51%
II	MA	RPP	8	20.5%
III	MA	RPP	4	10.25%
IV	NAP	RPP	1	16.5%
	MA	RPP	3	8%
OUTLIERS	KA	RPP	1	17%
	NAP	RPP	1	16.5%
	MA	RPP	4	10.25%

Table III.3. Intra –site fabric homogeneity / variability.

Even if it is still impossible to discuss with certainty which of these fabrics are produced locally at Marki, and which are imported from other centres of the region[34], such as *Ayia Paraskevi*, it can be at least argued that there is a significant proportion of pottery that is distributed within this central region, and that fabrics II, III and IV can be considered if not local, then certainly regional to Marki. The inclusion of sample RPP NAP-11 from *Ayia Paraskevi* in fabric IV is especially interesting, as it is suggestive of a potential regional distribution of fabric IV. On the other hand, the presence of metamorphic rocks, such as chert and quartzite, as well as the presence of muscovite mica, suggest that fabric I was imported to Marki from another region, further away from the Troodos ophiolite.

In addition to its wide scale of distribution, fabric I seems compositionally more homogeneous than the other fabrics. Considering that RPP vessels are handmade, there is a relative ely high degree of homogeneity; the vessels made with fabric I are mineralogically easily distinguished from all the other samples in thin

[34] In the absence of written justification, it is impossible to know the exact boundaries between the different regions of the island in the BA. However, Georgiou's attempt (2006) to explain regional development in association with the structure of the island's natural landscape and to propose a general overview of regional division in Cyprus from the EBA to the beginning of the LBA is justifiable. This thesis follows Georgiou's depiction of BA Cyprus' regional divisions (2006, 48, Fig. 5.1).

section and, typologically, RPP made with fabric I is characterised by standard forms, standard wall thickness and standard techniques of surface treatment (**Figures III.2-III.6**).

There is a pronounced regularity characterising the RPP flat bases (**Figure III.5**), all of which follow the same shape. These very characteristic and easily distinguished RPP bases were sampled from different sites (RPP KA-4, RPP PLK 3, RPP PLK-35, RPP MA-14370, RPP MA-16511, RPP MA-16733 – **Appendix III.1**), but were all found to be made with fabric I. This observation strengthens the argument that the corresponding vessels were all manufactured at a specific production area, and that they were then distributed to the settlements where they were recovered. Other sampled bases, differing in shape, such as RPP MA-13085 and RPP MA-14279, are made with different fabrics; in the former case with fabric II and in the latter with fabric III, suggesting that these differing types were produced probably at other contemporary production centres.

A similar observation can be made when assessing the differentially fired samples, all of which were made with calcareous clays. Of the nine differentially fired samples, six were found to be made with fabric I; an observation which explains the strong typological and stylistic similarities among them. On the other hand, the small, evenly burnished and highly lustrous sample RPP MA-7412 from Marki is made with fabric IV, while the partially black-topped sample RPP KA-3, from Kyra, was defined as an outlier, since it did not present any compositional similarities with any of the other analysed samples. Finally, the differentially fired RPP MA-15309, with the glossy black exterior and interior surfaces, is made with fabric III.

A more diverse picture emerged after the study of the different types of incised decoration on RPP samples. As has already been argued, the five samples (RPP PLK-24, RPP PLK-25, RPP PLK-26, RPP PLK-27, RPP PLK-34, see **Appendix III.1**) from tomb 1 at *Laksia tou Kasinou* carry the exact same type of incised decoration, characterised by shallow, carefully made incisions without any indications of lime filling; all five samples are made with fabric I.

However, within the larger group of samples from Marki, incised decoration is more diverse. In addition to the shallow incisions without filler (**Figure III.55e**), other types of incised decoration are also recorded including deep incisions filled with white paste (**Figure III.55a, c and d**), and fine, deep incisions without any traces of white paste filling (**Figure III.55b and f**). This more diverse picture of surface decoration could correspond to the fabric variability observed within the Marki sample, in comparison with the *Laksia tou Kasinou* sample, which is stylistically and compositionally very uniform. But, does each type of incised decoration corresponds to a different fabric, and consequently to a different workshop?

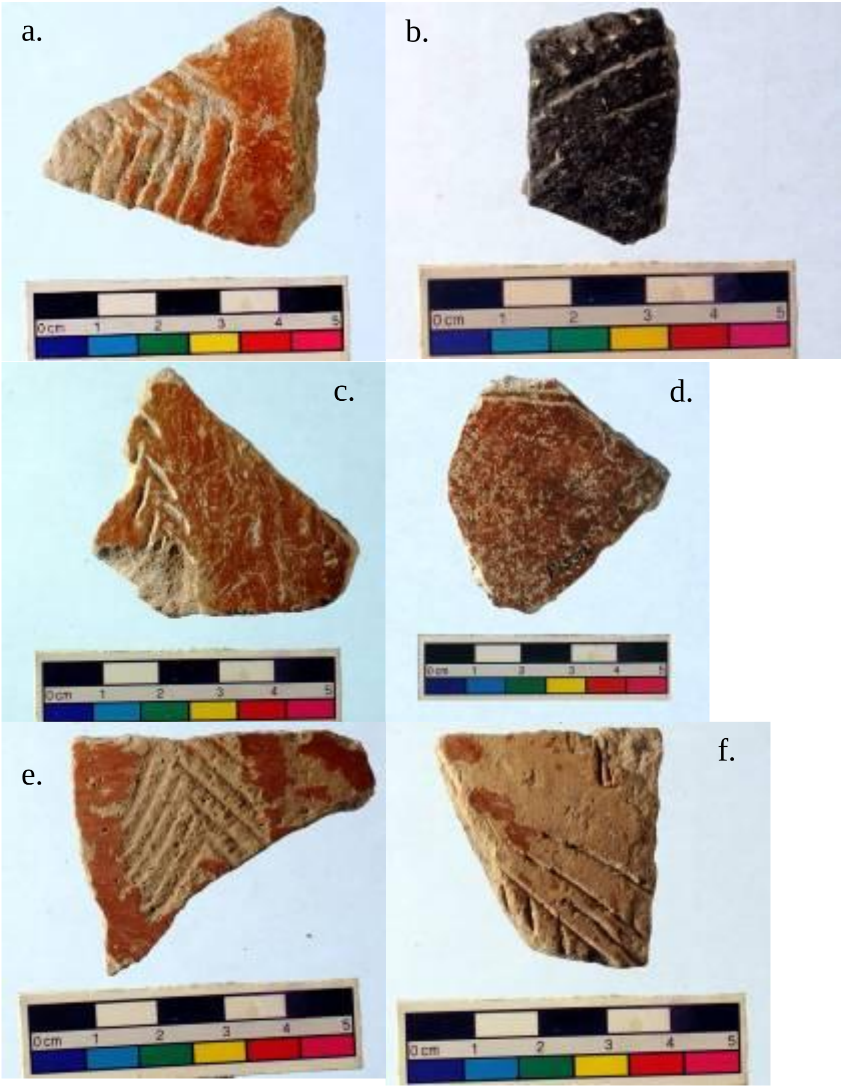


Figure III.55. The incised RPP samples from Marki. **a.** RPP MA-3570, **b.** RPP MA-8962, **c.** RPP MA-9398, **d.** RPP MA-15316, **e.** RPP MA-16438 and **f.** RPP MA-16452.

All incised samples are exclusively made with calcareous clays, meaning that this was an island-wide technological convention for making incised pottery. RPP MA-16438 (**Figure III.55e**) is the only sample that can be stylistically linked with the samples from *Laksia tou Kasinou*, and it is also made with fabric I. Nonetheless, fabric I is also used for the production of RPP MA-3570, RPP MA-8962, and RPP MA-15316 (**Figure III.55a, b and d**), which, contrarily, are stylistically different from the RPP samples from *Laksia tou Kasinou*. Samples RPP MA-9398 and RPP

MA-16452 (**Figure III.55c and f)** were categorised as outliers, due to compositional differences between them and all the other analysed samples.

Therefore, there are not any clear associations between style and fabric. Fabric I was used for the production of the stylistically uniform incised RPP pottery from *Laksia tou Kasinou* and RPP MA-16438 vessel from Marki, but was also used for somewhat differently decorated vessels, with deeper incisions, which were filled with lime, like RPP MA-3570 and RPP MA-15316. These observations could be used as evidence to argue the coexistence of different production centres (and/or potters using a range of incised decoration techniques) within the same area for the manufacture of vessels in fabric I. Other fabrics were also used for the production of RPP incised pottery, which however differ in execution from those made with fabric I.

In addition to the different styles of incised decoration, another surface treatment attribute, interesting to consider, is the burnishing marks visible on the RPP samples. These clearly visible burnishing marks actually constitute one of the main characteristics of the ware. Burnishing was done on a dry surface with a smooth and hard tool, such as a pebble, bone, horn or even seeds (Rice 1991, 138; Webb 1994, 14). Each stroke of the burnishing tool led to the compaction and reorientation of the clay particles, leaving distinctive narrow parallel, linear facets (Rice 1991, 138), which can be so easily distinguished on RPP pottery.

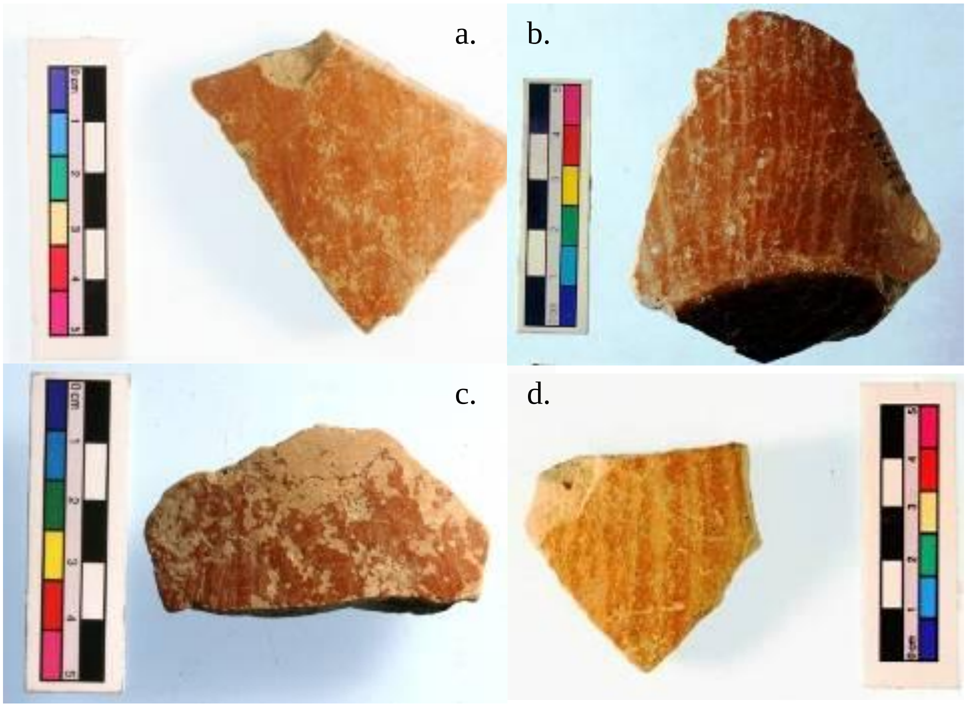


Figure III.56. RPP pottery with visible burnishing marks. **a.** RPP KA-5, **b.** RPP MA-13143, **c.** RPP KM-53, and **d.** RPP PLK-28.

It seems that the Philia potters were deliberately burnishing their pots in a more careless manner to produce the irregular, streaky lustre and incomplete coverage effect (see also Rice 1991, 138), which is often found on many samples made with fabric I (**Figure III.56a-d**). On many occasions, the potters were using this technique to create different lustre-on-matt patterns on their vessels' surfaces (**Figure III.57a-b**). It should be highlighted that the irregularly-burnished effect is found on vessels made with all recorded fabrics (**Figure III.58a-d**), suggesting that during the Philia phase this was a wide-known technique in Cyprus.

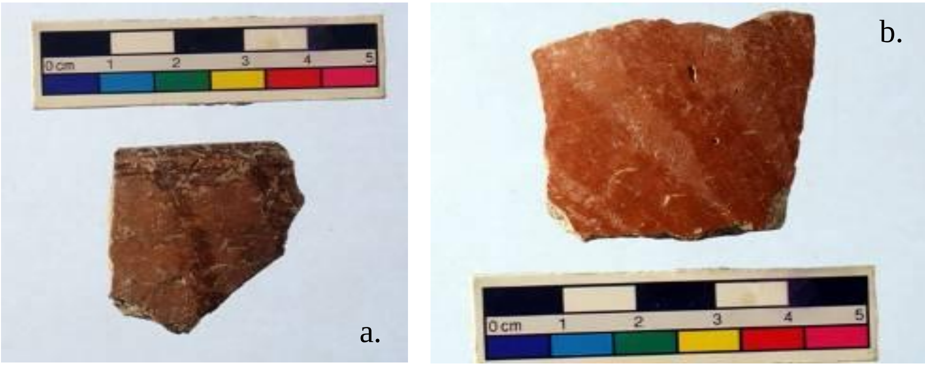


Figure III.57. RPP stroke burnished pottery from Marki. Both specimens are made with fabric I **a.** RPP MA-7229, **b.** RPP MA-9369.

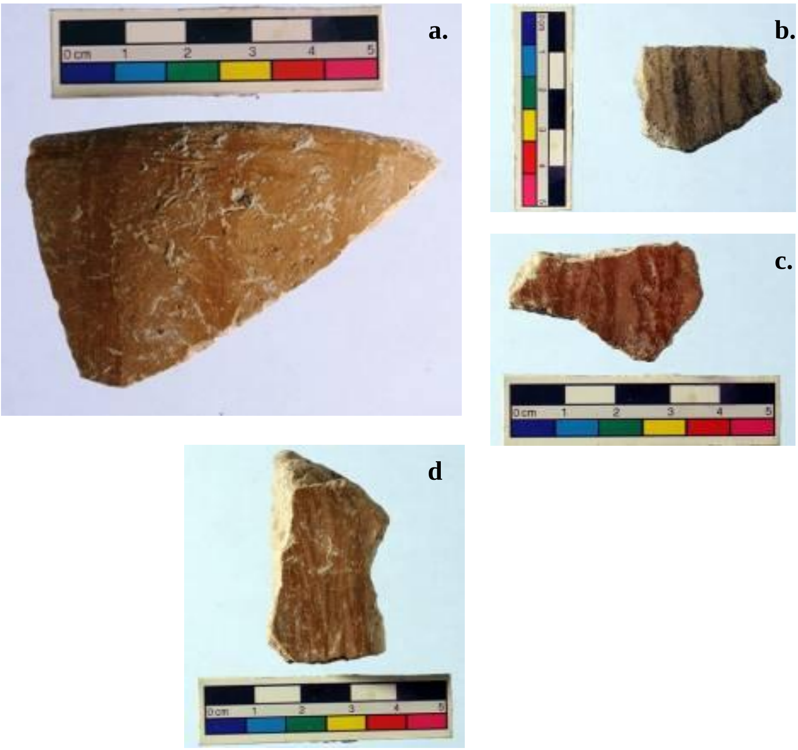


Figure III.58. Irregularly and stroke burnished RPP samples made with different fabrics. **a.** RPP MA-16408 made with fabric II, **b.** RPP MA-5094 made with fabric IV, **c.** RPP MA-5096 made with fabric II and **d.** RPP MA-4258 made with fabric III.

An evaluation of all the accumulated information regarding the macroscopic variability within and among the defined fabrics, suggests that different production centres were using a similar range of techniques and materials for the production of macroscopically similar pottery in different regions of the island, sharing the same tradition. Among the defined fabrics, the presence of fabric I in all sampled sites and the overall typological, stylistic and compositional uniformity of fabric I is unprecedented. Specifically, the RPP pottery made with fabric I is macroscopically characterised by a specific type of flat base, shallow incisions without any white paste filler, highly lustrous surfaces, which are often stroke or irregularly burnished, or differentially fired. These stylistic attributes were applied on a specific range of shapes, following certain technological and stylistic conventions.

However, it should be borne in mind that RPP vessels made with fabric I share common stylistic attributes with RPP vessels made with the other defined fabrics, and they should not be distinguished as a separate group of “special” RPP vessels. As the RPP irregularly-burnished and incised samples made with other fabrics have suggested, fabric I was not the only one used for the production of this style of pottery. As has been recorded at Marki, fabrics II and III and even the more igneous fabric IV, all of which belong to a different regional context of production from fabric I, were used for the production of more elaborate RPP vessels. What distinguishes fabric I from all the rest is not the quality of execution or decorative elaboration, but the degree of typological and compositional uniformity, and the scale of long-distance distribution.

It is interesting to examine the degree of fabric homogeneity (or variability) within single site assemblages, in order to understand and assess the scale of ceramic production and distribution at each one of the Philia sites. **Table III.3** shows that all RPP pottery samples from Vasilia, Kissonerga, and the large sample from *Laksia tou Kasinou* are made with fabric I. Moreover, almost all samples from Kyra and *Ayia Paraskevi* are also made with fabric I, with the exception of three samples, RPP KA-3 and RPP NAP-16, which were defined as outliers, being mineralogically different between them and from all other samples, and RPP NAP-11, which is made with fabric IV.

In contrast to the intra-site fabric uniformity characterising the site sample assemblages from Vasilia, Philia and Kissonerga, there is some fabric variability recorded within the site sample assemblages from Kyra and *Ayia Paraskevi* and to a larger extent within that from Marki. This fabric variability within single site assemblages raises questions regarding the representativeness of the sample under study, particularly with such variations in sample size among different sites. It also makes one wonder whether arguments formed while evaluating these analytical results can be applied to the entirety of the RPP population at the sampled sites, especially bearing in mind that most of these samples come from the closed and well-controlled environments of tombs.

It is acknowledged that the selection and comparison of samples coming mainly from tombs – and thus belonging to a narrow temporal spectrum, and possibly made by the same producers – provide an artificially limited sample of the total number of vessels produced and used in the respective community. However, as has already been explained in Chapter I, Philia recovered material mainly belongs to small tomb assemblages, (the only exception being Marki[35]), and thus questions regarding the actual representativeness of the sample under study cannot be addressed until larger samples are made available for analysis. It is noted that while this research was developed with the data currently available, it did not overlook such concerns which will hopefully inform future projects.

The emerging picture of RPP production and distribution is comprised of local, regional and supra-regional production centres that were producing pottery of similar fashion across the island. In addition to local and regional production, it seems that the Philia communities were participating in a supra-regional, island-wide ceramic network, which was circulating pottery of fabric I all over the island. In this wide and multifaceted network of contacts and pottery circulation, it should be argued that small settlements, like Marki, almost certainly played the role of recipients, while other, perhaps larger and certainly better-located, settlements were distributing pottery alongside other commodities.

The results of this study were compared with the results of earlier studies on RPP pottery. An earlier electron microprobe analysis on ceramic samples (including RPP pottery) coming from Marki, had assigned a local character to their production, with the argument that

[35] The RPP assemblages from Kyra and Kissonerga come from trial trenches and upper, plough-disturbed deposits respectively.

> "all mineral inclusions found in the Marki ceramics can be found in the nearby volcanics and intrusives. […] The minerals identified in the pottery samples are therefore all available in the area of Marki. This suggests local ceramic production for all wares, with the possible exception of DP […]." (Summerhayes *et al.* 1996, 179).

Although Frankel and Webb previously argued for local manufacture (Webb and Frankel 1999, 17; Summerhayes *et al.* 1996, 179), in their latest volume on Marki, they revaluated their argument and suggested that RPP was reaching Marki in substantial quantities from one or more larger settlements located elsewhere in the region (Frankel and Webb 2006a, 92-93). This reassessment of their original argument was based on the extreme uniformity of RPP vessels found at Marki and elsewhere. As Frankel and Webb observed "this homogeneity in clay type is matched by similarities in shape and surface treatment and is in sharp contrast to both Late Chalcolithic and EC/MC monochrome wares, which display far greater regional variation even when morphology and surface treatment are similar" (Frankel and Webb 2006a, 92).

Robertson's analytical results (1989) regarding the petrographic analysis of RPP samples from Kissonerga have already been discussed, stressing the close similarities in fabric patterns with the samples from Marki. Somewhat similar results were produced using INAA and petrography for the study of RPP pottery from different sites by the University of Edinburgh. The INAA analyses (Stephen 1998a; 1998b) included samples from the sites of Kissonerga *Mosphilia*, Sotira *Kaminoudhia*, Khrysiliou *Ammos*, Vasilia *Evrima*, and Philia *Vasiliko*.

These analyses did not give a clear answer as to ceramic provenance. According to Stephen (1998a, 144), "whether or not pottery was locally made is debatable, but the Kissonerga samples seem to come from a common centre of manufacture" (Stephen 1998a, 144). Stephen also noted a close chemical and mineralogical similarity between the samples from Kissonerga and those from Vasilia (Stephen 1998b, 174). On the other hand, she found the samples from Sotira *Kaminoudhia* to be mineralogically very different from all the other samples under study, being coarser and sandier in texture, containing inclusions such as olivine, feldspars, and volcanic glass (Stephen 1998b, 174). Stephen, therefore, has also demonstrated that pottery circulation networks of differing sizes concurrently existed on the island during the Philia phase, one at least linking the north with the south, with other(s) being of a more localised or regional character, linking neighbouring communities.

With the exception of the analyses conducted on material from Marki using electron microprobe analysis, which had concluded that all pottery from Marki was locally produced at the settlement, and which were later revised in favour of regional – rather than local – production, the other two earlier analytical works, using petrography and INAA, agreed that there were more than one production centre producing and distributing RPP pottery, and that a large proportion of RPP pottery from different sites shares common compositional characteristics. Combining all the existing evidence together, it seems that whereas there is some compositional variation within the RPP site assemblages from Kissonerga and Marki, the large sample from *Laksia tou Kasinou* is entirely made with fabric I, just like most of the samples from Kyra, and as INAA (Stephen 1998a) has indicated, all of the samples from Khrysiliou.

The tight compositional cluster created by the samples made with fabric I, cannot be simply explained by arguing that similar types of calcareous clays were used across different regions, but rather that a particular clay resource was exploited for the production of the respective ceramics. This argument becomes stronger if the degree of homogeneity characterising the calcareous fabric I is compared with the compositional consistency characterising other calcareous groups, identifiable within the framework of this study (fabrics II and III), but also in earlier studies (fabrics A and B in Dikomitou 2007). Moreover, the consistency and regularity of shapes and surface treatment strengthen further the argument that a specific production centre or cluster of neighbouring centres was responsible for the production and distribution of vessels made with fabric I.

Unfortunately, pinpointing the provenance of fabric I is unattainable at present as there is not enough geochemical information available for comparing the mineralogical and chemical characteristics of the vessels made with fabric I with those of distinct geological regions. Likewise Robertson’s earlier petrographic study (1989), it is only assumed that the raw materials for the production of fabric I derived from the northern part of the island due to the very limited presence of igneous components that mainly characterise the central and southern parts of Cyprus, encircling the Troodos mountains (Constantinou 2007, 338; Xenophontos 2002, 44; Xenophontos *et al.* 2002, 177). In addition, cherts, the most distinct constituent of fabric I, are common components of the Kythrea formation, as well as other metamorphic rocks, such as quartzite, metachert and mica schists[36] (Ducloz 1972, 5, 38). However, the Kythrea formation expands across the northern part of the island, and thus, any attempts to narrow down the potential candidate sources for the acquisition of the raw materials with which fabric I is made were not fruitful.

Comprehending the ambiguities of assigning provenance to fabric I on simply petrographic terms, we now turn to the archaeological data in order to assess the possibility of potential areas to be the actual sources of this fabric. Considering the fabric homogeneity that characterises the samples coming from all the sites of the Ovgos valley, as well as the fact that almost all sampled pottery coming from these sites is exclusively made with fabric I (only one RPP sample from Kyra was classified as an outlier), and particularly considering the sheer number of samples from the Ovgos valley made with fabric I, it would not be groundless to argue that this cluster of settlements in the Ovgos valley is a strong candidate for the manufacture and wide distribution of RPP pottery across the island.

Another candidate source could be Vasilia, which is differentiated from all its contemporaries due to the wealth of local tomb deposits in metal and other materials and the elaboration of the tombs' architecture, cultural elements, which are not met in other Philia sites. In combination with the recent findings of LI analysis on metal artefacts from Vasilia, conducted by Webb, Frankel, Gale and Stos-Gale, the reconstruction of an exceptional Philia community at Vasilia cannot be questioned. Vasilia could operate during this time, both as a gateway outside Cyprus, and as a key community for the distribution and exchange of materials within the island. Nevertheless, as has already been argued, there is not adequate information to identify the origin of fabric I, neither the number of centres involved in this fabric's production, and all the abovementioned arguments will remain archaeological speculations until systematic surveys on the entire island establish a detailed geochemical map of Cyprus.

In the study of Early and Middle Bronze Age regionalism, stylistic variation has been used as a primary tool for the division of Cyprus into cultural zones (e.g. Åström 1957; Stewart 1962; Frankel 1974a; Herscher 1981). However, in contrast to the pronounced regionalism that characterises the EC and MC periods, the

[36] Also, muscovite mica comes from the north of the island rather than the south (C. Xenophontos 2007, pers. comm.)

homogeneity observed in the ceramic record of the Philia phase suggests a common, widespread culture (Webb and Frankel 2008b, 288; Frankel and Webb 2006a, 307), with a very limited degree of regional variability. The coexistence at Marki of ceramics produced locally and/or regionally, and those distributed from more distant centres shows that contacts during the Philia phase were not only strong on a regional level, but were also extended beyond regional boundaries.

Philia ceramic uniformity can be understood on two different axes; in terms of a common model for the production of very similar pottery at diverse local communities across the island, as well as the distribution of pottery from a specific centre or cluster(s) of centres, widely across the island. Both conditions presuppose a regular flow of interaction between different parts of Cyprus, and a typologically and stylistically uniform material culture across the island. Therefore, the spread of the Philia culture into these dispersed and topographically separated regions, and most significantly the maintenance of cultural uniformity, for approximately three centuries (Frankel and Webb 2006a, 35; Peltenburg 1998), are remarkable. It seems that regionalism, in the way it is perceived in relation to the EC and MC periods, meaning the definition of cultural regions using stylistic variation, and the recognition of inter-regional contacts based on stylistic similarities (e.g. Frankel 1974a, 1974b; 1978) is not the case in the earlier Philia phase, as a very uniform material culture is in place across the island.

This selective preference in calcareous clays, rich in carbonates, is perceived as a conscious technological choice, acquired through experience, supporting primarily the functionality of the final products. This technological uniformity coupled with the restricted stylistic and typological repertoire could also be considered as forms of communication and social marking, facilitating the exchange of information concerning social and cultural identification (Jones 1997, 113), between the dispersed Philia communities.

It is certainly difficult to elucidate the routes of interaction between Kissonerga, and the northern settlements at Ovgos and Vasilia, separated by the Troodos massif. Nonetheless, it seems that geography and long distance did not act as impediments in this attempt at cultural maintenance; established inter-group relations, facilitated by the introduction of donkeys, structured a firm network of interaction, which can explain the widespread and unprecedented cultural uniformity which characterises the Philia settlements. It is in this context of constant interactions that the wide distribution of RPP vessels of fabric I should be understood. The existence of fabric I at all these different sites reinforces the arguments of active interaction networks, literally surmounting physical barriers and contributing to this intra-island uniformity of the Philia material culture.

It is worth considering the mode of organisation of ceramic production that could sustain this multilevel network of social contacts and pottery distribution locally, regionally and inter-regionally. The sheer quantities of recorded pottery made with fabric I, recovered at sites across Cyprus, counter any arguments for the production of fabric I at a household level. On the contrary, the uniformity of the RPP assemblage prompted some scholars to ascribe the ware to specialised production associated with emergent elite. As has already been mentioned, according to Manning:

> “the marked uniformity of fabric […] reflects the rise of one dominant specialist production centre exporting all over the island or the spread of a specialist type and technology across the island as a valued prestige assemblage”(Manning 1993,48).

Considering the new analytical data, it seems that Manning’s initial argument for a large, widely exporting production centre could have a degree of validity, though it was clearly not unique. The mineralogical and chemical variation observed in the larger sample from Marki in correlation with the results of earlier analytical works, suggest that RPP pottery was both locally produced at this site, and imported from several other production centres. What is more noteworthy is the fact that RPP pottery made with different fabrics, and therefore by different production centres, is typologically and stylistically very similar, exemplifying the cultural unity and strong interaction among them (compare **Figure III.57.a** with **Figure III.58.a,** and **Figure III.58.b** with **Figure III.58.c**).

As has already been discussed in Chapter I, a significant topic of debate among archaeologists studying the Philia phase is whether an elite class had already been established on the island, controlling the raw material resources and production activities. The existence of an elite class is strictly related by many researchers with the introduction of the Bronze Age culture in Cyprus, as well as the establishment of a new socio-economic system, which promoted interaction with the surrounding Mediterranean regions and stimulated metal craftsmanship and trade with the outside world (Kouka 2008; Knapp 2008; Peltenburg 1996; Peltenburg 1994; Knapp 1994a; Manning and Swiny 1994; Knapp 1993; Manning 1993).

These arguments about the social complexity of the Philia communities are based primarily on mortuary data, the existence of metal artefacts in funerary deposits (see Kouka 2008; Knapp 2008 and Keswani 2004), the metal hoards found at, or linked with Vasilia, and other luxury objects, such as alabaster vases, gold jewellery and fine pottery (Keswani 2004, 63; Hennesy *et al.* 1988). For the researchers favouring the emergence of an elite class of consumers, there is no doubt that all the recorded metal artefacts, many of them being of Anatolian origin (Webb *et al.* 2006), and other luxury items, document this class of socio-economic elites (Kouka 2008, 38).

Keswani observed that

> "with the onset of the so-called Philia facies, the bestowal of grave goods seems to have become a standard practice throughout the island. A small number of pots and other objects such as stone and faience necklaces may be noted in the Late Chalcolcolithic, transitional Philia chamber tombs at Kissonerga *Mosphilia* (Peltenburg 1991a, 30; Peltenburg 1998, 90-92), and thereafter 'Philia Culture' were often equipped with larger and more diverse arrays of goods that included pottery, spindle whorls, shell pendants, flint blades, various small stone objects, and copper based artifacts such as knives, toggle pins, and spiral earings. […] Given the exceptional concentrations of wealth in tombs at Vasilia *Kafkallia* and in the later, or partially contemporaneous cemeteries of Bellapais *Vounous* and Lapithos *Vrysi tou Barba*, some researchers have argued for the emergence of a hereditary, status conscious elites during the EC-MC period (Manning 1993; Peltenburg 1994 " (Keswani 2004, 63).

Keswani (2004, 63) further emphasised that a more systematic study of both the distributional patterns of funerary goods among synchronous tomb assemblages and the diachronic increases in "mortuary expenditure" from the Philia to the EC and MC periods, can be suggestive not of the gradual emergence of a social hierarchy, but rather to the elaboration of a vibrant intra- and inter-settlement prestige competition. This "ongoing dynamic of prestige competition within and between communities" (Keswani 2004, 63) could have been gradually developing all through the Philia phase, during this period of major changes in every aspect of everyday life on the island, and become even stronger during the EC period when a tendancy towards regionalism manifested itself.

In addition to Keswani's argument, Frankel and Webb argued that

> "the social ritual of communal drinking in the Philia [period], suggested in particular for mortuary contexts by the predominance of cutaway-spouted jugs, fine ware amphorae and small bowls […] appears to have been a behaviourally and socially static practice designed to promote a shared identity and maintain rather than transform the socio-political order" (Webb and Frankel 2008b, 293).

This final argument explains better the regular presence of ceramic fabric I in tomb assemblages, as well as in settlements. Considering earlier and new analytical studies of Philia pottery, there is nothing in the archaeological record to foster arguments in favour of differing target classes of consumers for pottery. Similar types of pottery were produced for distribution within and between small and large settlements.

It should also be noted that there is no obvious differential spatial patterning of fabrics or imported products among the three Philia compounds represented in the Marki sample[37], and that the different Philia fabrics are evenly distributed inside and outside the Philia architectural units. Taking into consideration both the results of this study, and particularly the observation that stylistically very similar RPP pottery was made with different fabrics, any arguments about the exclusive use of the widely distributed RPP pottery "as a valued prestige assemblage" cannot be supported.

What can safely be argued is that during the Philia period there are differences in the size of settlements, as some settlements seem to have been larger than others. Settlement size estimates especially for prehistoric Cyprus can be problematic, due to the restricted number of excavated settlements, and are mostly based on the quantification of the available burial data from the numerous cemeteries across the island (*cf.* Webb and Frankel 2004). Thus, the exceptional size of the cemetery at Vasilia (Stewart 1962) implies the existence of a corresponding settlement, larger than its contemporaries.

The earlier studies reviewed and the research reported here have shown that this important settlement was part of a uniform Philia culture on the island, and that at least a part of its pottery was identical with pottery from other smaller, contemporary settlements in Cyprus, just like Marki. So the new analytical dataset confirms and reinforces earlier arguments regarding a network of material flows between the Philia

[37] Reference is made to the spatial distribution of Philia fabrics, directly related to contexts dated to Philia occupational phases A and B, meaning potsherds that were found in their original contexts and not as residual material in contexts dated to later phases.

settlements, in which both larger and smaller settlements located in different regions of the island actively participate. At the same time this flow of contacts and commodity exchange could serve another need; it could articulate and reinforce the common identity of these communities through this uniform material cultural and cultural practices.

The Philia phase is a cultural period wedged between the Cypriot Chalcolithic and the Cypriot Bronze Age, dated approximately between 2500 and 2300 BC. Overall, RPP pottery emerges from this case study as a product of a coherent Philia society widely spread across different parts of Cyprus, which succeeded for some time to remain homogeneous in its practices through constant interaction, establishing the foundations on which at sometime around 2300 BC, the fully developed Early Bronze evolved. While some of the aforementioned settlements ceased to exist, others such as Marki entered a new era of more diverse traditions and different forms of regional interactions.

Ceramic fabric IV is the only apparent departure from the established Philia tradition and the general preference for calciferous material. In terms of fabric the concurrent exploitation of igneous material resources and alluvial deposits for the production of RPP at Marki and *Ayia Paraskevi* could be seen as a technological overlap between the standard, well-defined Philia and the following less uniform EC I-II ceramic traditions, as both settlements continue to be inhabited until the MC and LC periods respectively, in contrast to other settlements such as Kissonerga and Vasilia which do not survive the beginning of the fully developed Early Bronze Age period.

Despite the outstanding sampling ambiguities encountered in the course of this study that need to be addressed with larger samples from more sites, this thesis has successfully demonstrated that the Philia phase must have been a very dynamic period of Cypriot prehistory, during which larger settlements had at their disposal the required means (including natural and human resources) for long distance contacts, supported by a very interactive internal network, sharing common cultural patterns. While smaller settlements produced their own products, they also acquired supplementary products from the larger settlements within this inter-linked system. Cyprus was not, however, able to sustain this degree of cultural homogeneity for long and it soon gave way, circa 2300 BC, to the pronounced regionalism which characterizes the next phase of the Cypriot Bronze Age.

CHAPTER IV

EARLY AND MIDDLE BRONZE AGE POTTERY FROM MARKI *ALONIA*.
A WINDOW INTO
CONTEMPORARY CERAMIC PRODUCTION, DISTRIBUTION, AND SOCIAL INTERACTION.

IV.1. Sampling Marki *Alonia*: ceramic wares and research questions

An attempt was made in Chapter I to present the most reoccurring issues of debate in the EC and MC literature, as well as some differing approaches to the study and interpretation of the EC and MC material culture. Central to these debates is the role of pottery, as the only adequately represented category of material in the Philia, EC and MC archaeological record, and therefore is the only type of material that can serve as a medium for the measurement of chronological and regional cultural variation.

The first case study explored the potential of pottery analysis to study regional spatial variations in production and distribution. This second case study turns towards the currently available data and focuses on one settlement on the island with a continuous lifespan from the Philia until the MC period, for a diachronic study of pottery from all the settlement's habitation levels. Earlier studies made stylistic and typological comparisons among contemporary ceramics coming from different sites, in order to draw conclusions about the degree of regional variation, and consequently social interaction. This research focuses exclusively on one settlement in order to record in particular the degree of technological variation in ceramics, and investigate pottery production and distribution at one community over time. This was considered to establish a good starting point for understanding pottery production at a single settlement, before expanding research horizons to regional and island-wide levels in future research. The only settlement that could currently serve the objectives of this type of research is Marki *Alonia*[38].

As has been reviewed in Chapter II, our knowledge regarding ceramic technology, production and distribution during the Philia, EC and MC periods exclusively derives from the numerous pottery artefacts *per se*. Therefore, a detailed analytical assessment of the main Philia, EC and MC pottery types at one settlement

[38] The excavations at Marki *Alonia* were conducted between 1990 and 2000, under the direction of Professor D. Frankel and Dr J. Webb of La Trobe University, Melbourne, Australia.

was essential for an enhanced understanding of the techniques employed in their production and the documentation of technological variation within a single settlement. The systematic and thorough recording of the Marki diagnostic assemblage by Frankel and Webb (1996; 2006a) provides an abundant and readily accessible databank for a technological study of the assemblage, combining the descriptive data with analytical assessments. Collecting samples from a stratified ceramic assemblage could allow the assessment not only of technological change through time, but also the local contextualised distribution of ceramic fabrics within the community.

Marki *Alonia* is an Early and Middle Bronze Age settlement (Frankel and Webb 2006a; Frankel and Webb 1996), located at the south of the Alykos River, in the cupriferous northern foothills of the Troodos mountain range, overlooking the fertile Mesaoria plain (**Figures I.1** and **II.1**), in an area where no preceding Chalcolithic activity has yet been recorded. Among the EC and MC excavated settlements in Cyprus, Marki stands out as the most extensively excavated and well-documented settlement of the period, and the only one occupied from the Philia phase until the MC II period. Most significantly, Marki is currently the only excavated site on the island to provide substantial evidence of the Philia and EC I/II periods from stratified, domestic contexts. The excavation project at Marki provides significant insights into the life of a Cypriot prehistoric village with a lifespan over half a millennium, from ca. 2400 to 1700 BC (Frankel and Webb 2006a, 35).

Period	**Phase**	**Absolute chronology**
Philia	A, B	*ca*.2500/2400-2200 BC
EC I-II	C, D	*ca*. 2300-2000 BC
EC III	E, F	*ca*. 2100-1900 BC
MC I-II	G, H, I	*ca*.2000-1700 BC

Table IV.1 Association between stratigraphic phases at Marki, conventional chronological divisions of the EC-MC periods, and absolute chronology (Frankel and Webb 2006a, 35).

The occupation span of the excavated settlement at Marki is divided into four broad chronological periods, Philia, EC I-II, and EC III and M I-II (Frankel and Webb 2006a, 90). The excavators of the site developed a sequence of nine occupational phases based on the settlement's stratigraphy, architecture and ceramic typologies (Frankel and Webb 2006b, 290 – **Table IV.1**). These chronological and occupational divisions were used to structure an investigation into ceramic variation through time.

The ceramic assemblage from Marki under study comprises the settlement's diagnostic assemblage, presently curated in the Department of Antiquities storerooms in Larnaca. The total number of diagnostics at Marki is 16880 specimens, and represents 5.5% of the recovered ceramic assemblage (Frankel and Webb 2006a, 89). Each individual diagnostic sherd was recorded in detail by the site excavators with information on the context of recovery, ware, fabric, interior and/or exterior surface treatment, and degree of preservation, oxidation, shape and wall thickness (Frankel and Webb 2006a, DVD html file).

Chronological distribution of ware at Marki	**Ceramic type**	**Occupational phase**
Philia	Red Polished Philia Ware	A-B
Philia	Philia Red Slip	A-B
Philia	Red Polished Coarse Philia	A-B
Philia	White Painted Philia	A-B
Philia	Black Slip and Combed	A-B
EC I	Red Polished South Coast	B-C
EC I – II	Red Polished I-II	C-D
EC I – II	Brown Polished	C-D
EC I - MC II	Red Polished	C-I
EC II - MC II	Black Polished	D-I
EC II - MC II	Drab Polished	D, H
EC III - MCII	Red Polished III	E-G, I
EC III - MC II	Early Red Slip	E-I
EC III - MC I	Early White Painted and composite Red Polished and White Painted	E-I
MC I – II	White Painted	H-I
MC I – II	Black Slip	G-I

Table IV.2. Synopsis of the wares recovered at Marki, together with the conventional Cypriot Bronze Age chronology and the occupational phases of the settlement with which they are associated. (Frankel and Webb 2006a, 89-154).

Table IV.2 presents a synopsis of the full series of wares identified at Marki, together with the conventional chronology and the occupational phases of the settlement with which these wares were associated. Sampling was focused on the main wares at the site, namely RP and Red Polished Coarse (hereafter RPC) pottery, including RPP (see Chapter III) and Red Polished Coarse Philia (hereafter RPCP). As has already been explained in Chapter II, sampling was primarily focused on the proportional representation of the main ceramic wares found at the site, in order to study the presumed local, everyday, utilitarian wares, employed in domestic activities, rather than the rarer and probably more exotic specimens. This choice of sample conforms to the prime research objective, which is an investigation into the technology of local ceramic production, its nature and evolution for over five hundred years.

Appendix IV.1 presents the total number of samples collected from each ware and each phase, as well as the shape of each sample. In addition to RPP, RPCP, RP and RPC, which are the main wares at the settlement from the Philia to the MC II periods, mealing bin, pan, hob (clay pot-stands) and loomweight fragments were also collected from different occupational phases of the settlement's lifespan. These ceramic artefacts are cross-culturally considered to be produced and used locally, and thus were included in the sample for compositional comparisons with the other ceramic samples, as well as the small number of soil samples collected from the vicinity of Marki (see Chapter II and **Appendix I**), in order to appraise the geological character of local production at Marki.

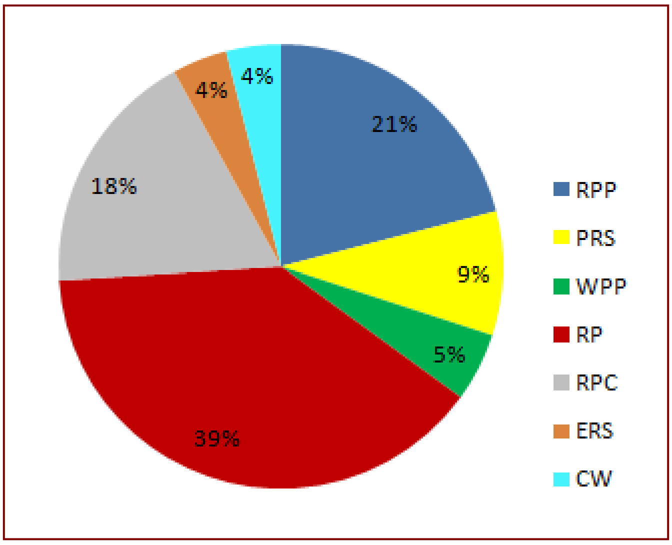


Figure IV.1. Percentage of each ware in the sample from Marki (in this graph CW includes mealing bins, hobs and loomweights).

Figure IV.1 shows the percentage of each ware in the analysed sample from Marki. Within the Philia horizon and in addition to the RPP and RPCP samples, Philia Red Slip (hereafter PRS) and White Painted Philia (hereafter WPP) samples were also collected for a more comprehensive assessment of ceramic production and distribution at Marki during the Philia phase. Early Red Slip (hereafter ERS), on the other hand, most probably an imported ware at Marki, completed the sample, providing a counterpoise to local production during the EC III-MC I periods.

The RPP sample coming from Marki has already been assessed in the preceding chapter (see also **Appendices III.1-III.4**). References to RPP are made in this chapter in order to provide a coherent picture of pottery production and distribution at the settlement throughout its lifespan, technologically comparing RPP with the other sampled Philia wares, but also with RP, which succeeds RPP in the EC and MC periods. PRS is the second largest category of Philia fabrics at Marki. However, in contrast to the RPP fine-textured, well levigated fabrics and their occurrence in well-defined shapes, PRS pots were characterised as being of a "poorer quality" and "cruder production" (Frankel and Webb 2006a, 90). Moreover, whilst the notable homogeneity of the RPP group and its stylistic similarities with the ceramics from other Philia sites were used as indications for the RPP's import from other settlements, PRS was argued to be locally produced at Marki (Frankel and Webb 2006a, 90-91).

PRS is better known from domestic contexts rather than tombs and especially some vessel shapes, such as the deep flat-based vat, braziers and baking pans, are only known from Marki (Frankel and Webb 2006a, 90-91). However most of the PRS shapes found at Marki are also found at other settlements (Frankel and Webb 2006a, 99), and there is a certain fusion of shapes between the main Philia wares, as some shapes such as the hemispherical and deep-bodied flat- and round-based bowls, cutaway-spouted jugs, flasks and amphorae, which are essentially RPP shapes, were also produced in PRS ware. However, some other shapes, such as neck juglets, a range of small bowls and dishes, miniature vessels, lids, vats and some jug types are seen only in PRS ware at Marki (Frankel and Webb 2006a, 98-99).

Decoration on PRS is almost absent and when found is restricted to simple incisions on handles (Frankel and Webb 2006a, 98). PRS ware was also found in other contemporary sites and was addressed under different names (see also Webb and Frankel 1999, table 2, 14), including Red Slip ware (Dikaios 1962), Red Polished I (Philia) subcategory (Stewart 1962), Red Slip (Philia) (Gjerstad 1989), "an alternative version of RPP" (Herscher 2003). "Red Polished (Philia) variant" described by Peltenburg *et al.* (1986) in their publication of the excavated material at Kissonerga *Mosphilia* could also refer to PRS ware.

The repertoire of PRS shapes at Marki is primarily associated with food processing and storage activities (Frankel and Webb 2006a, 99). In terms of its production context, it was argued that despite the fact that PRS and RPP are found side by side

> "they are unlikely, however, to have been produced by the same potters and most probably represent two different contexts of production. Specifically, it may be suggested that the higher quality ceramics were reaching Marki from one or more, larger settlements located elsewhere, while the poorer quality vessels were made locally by less experienced potters to supplement the supply of imported pots and provide vessels for particular production activities" (Frankel and Webb 2006a, 91).

PRS was differentiated from RPP by both Dikaios (1962, 167) and Stewart (1962, 223-224); both of them considered it as a coarser variety of RPP (Dikaios 1962, 167; Stewart 1962, 223). In order to understand the relationship, if any, between the two wares, further investigations were made in the framework of this project. The technological and compositional characteristics of RPP and PRS samples were initially examined within their own groupings and then were cross-examined for inter-ware comparisons, and in order to understand whether they share common technological features or whether they represent two differing contexts of production, as argued by Frankel and Webb.

The frequent occurrence of WPP in small and medium-sized bowls and its restricted presence at Marki, prompted Frankel and Webb to suggest that this ware was probably imported to the settlement as table ware (Frankel and Webb 2006a, 91, 101). WPP ware is also found at Philia, Deneia, Khrysiliou, Kyra, and *Ayia Paraskevi* in Nicosia. Its occurrence seems to be focused on the Ovgos valley and Mesaoria plain, while the scanty quantities of WPP at Vasilia suggest that WPP was imported to the north coast from either the Ovgos or the broader Mesaoria plain (Webb and Frankel 1999, 24).

WPP seems to have been made with similar fabrics as RPP, but there is a greater incidence in fine to very fine fabrics (Webb and Frankel 1999, 25). The painted decoration is executed with red to red-brown paint and includes a variety of motifs such as horizontal bands, zigzags, wavy lines, chevrons, and latticed and ladder-pattern panels (Webb and Frankel 1999, 25). Beneath the painted decoration, the exterior surface of WPP is found both slipped and unslipped; both varieties seem to coexist at Marki and other sites (Webb and Frankel 1999, 25). Some samples belonging to WPP ware were collected from the diagnostic assemblage of Marki, for a more complete overview of the Philia ceramic repertoire at the settlement from a technological perspective and in order to understand the scale of both local ceramic production and ceramic import at the prehistoric village.

The combined technological study of the three Philia wares, namely RPP, PRS and WPP has been conducted with several questions in mind. In addition to the questions raised in the preceding chapter with the central aim to examine how the morphological homogeneity in the RPP assemblage can be interpreted compositionally, PRS and WPP were sampled in order to assess whether PRS and RPP indeed belong to two different contexts of production, and if this argument can be documented from a technological point of view. Moreover, were the slipped and unslipped versions of WPP associated with different production centres or were they produced by the same production centre? And to what extent do these wares share similar technological features? What is the degree of technological and fabric similarity among the three Philia wares, and what does this imply about the nature of ceramic production during the Philia phase?

The RP assemblage at the site can be broadly divided into RP I-II dated to the EC I-II periods, and RP III which dominated during EC III-MC II periods. RP pottery from the EC contexts differs significantly stylistically and technologically from the earlier and sometimes overlapping RPP vessels. RP samples from phases A to D differ also significantly among themselves, particularly in terms of fabric and surface treatment. Comparing the stylistic characteristics of RP I-II pottery at Marki with that recovered at other sites, similarities are observed with southern sites, such as Psematismenos (Todd 1985; Georgiou 2000; Frankel and Webb 2006a, 106).

> "The RP I-II ceramics are most closely associated with assemblages from the centre and south while RP III repertoire belongs to a broader ceramic tradition which appears to have been in place across the island by EC III" (Frankel and Webb 2006a, 108).

Frankel and Webb argue that there is less regional variation in RP III, and that Marki RP III is almost identical to EC III and MC I RP pottery from a range of sites across Cyprus (Frankel and Webb 2006a, 107).

RP represents 39% and together with RPP (21%) represent 60% of the entire Marki analysed sample. The selection of 111 RPP and RP samples and their physicochemical characterisation aims at addressing the technological evolution of the broader red monochrome pottery tradition from the Philia to the MC period, and assessing technological and compositional variation within and among RPP, RP I-II and RP III. Addressing, and eventually understanding the degree and forms of variation within these chronological and typological divisions of the broader RP tradition at a single settlement could effectively contribute in the future towards comprehension of island-wide RP production and distribution.

In addition to RPP and RP, RPCP and RPC samples, mostly cooking pot sherds, were also collected for a more general consideration of the relation between ceramic technology, fabrics and functional groups. Among the many ceramic vessels of Bronze Age Cyprus, the cooking pot is one of the most frequent shapes found and, paradoxically, one of the most overlooked; its coarse, undecorated appearance being the main reason for its relative state of neglect.

On the other hand, a series of experimental and ethnographic studies (e.g. Hein *et al*. 2008; Buxeda i Garrigós *et al.* 2003; Tite and Kilikoglou 2002; Tite *et al.* 2001; Longacre *et al.* 2000; Kilikoglou *et al*. 1998; Vekinis and Kilikoglou 1998; Schiffer *et al.* 1994; Bronitsky and Hamer 1986) have shown that this "unattractive" functional class of pottery is often highly specialised, its intended function requiring good knowledge of the mechanical and thermal properties of raw materials and finished products. These studies call for a re-evaluation of the technological significance of cooking pots in antiquity and highlight the importance of cooking pot studies in appreciating the ancient potters' knowledge of material properties, as well as the evolution of ceramic technology.

The cooking pot appears for the first time in Cyprus at the beginning of the Bronze Age (Frankel and Webb 2006; 1996; Webb and Frankel 1999), the earliest stratified examples coming from the Philia contexts of Marki. Therefore, Philia cooking pot fragments were included in the Marki sample for a technological assessment of cooking pot fabrics throughout the lifespan of the settlement.

During the Philia phase, there are two different types of cooking pots, which are similar in size, but differ in body shape and fabric (Frankel and Webb 2006a, 100). They have been named Types a and b by Frankel and Webb, for purposes of convenience and clarity (Frankel and Webb 2006a, 100).

What distinguishes Philia cooking pot Type a from Type b is the presence of small white inclusions evenly distributed through the section of the samples; other greyish inclusions of a relatively larger size are also visible. A number of parallels have been found in tombs at Philia *Laksia tou Kasinou* (Dikaios 1962, 173), Episkopi

Bamboula (Benson 1972, 66) and Sotira *Kaminoudhia*[39] (Herscher 2003, 186; Frankel and Webb 2006a, 100). According to Frankel and Webb (2006a, 133), the vessels of Type b are the direct forerunners of the EC-MC cooking pots, and perhaps this is the reason why it was not easy to identify and collect samples of Type b from the broader cooking pot assemblage. As the excavators argue "recognition of earlier RPC cooking vessels is also hindered by the high degree of ceramic fragmentation in Phases C and D and similarities in form and fabric between early RPC and Philia cooking pots" (Frankel and Webb 2006a, 133).

In EC I-II, there are two types of cooking pots identified in use, both deriving from Philia Type b (Frankel and Webb 2006a, 134). It seems that there is a general sharing of fabric similarities between cooking pots and RP vessels, especially jars. "The fabric identified as RPC is not truly distinct from RP but rather adopted to a specific use within the broader RP tradition" (Frankel and Webb 2006a, 133). By EC III – MC I, cooking pot shapes and fabrics become more easily identified as they become more refined and standardised (Frankel and Webb 2006a, 133). Cooking pots from EC III onwards are made in three types, namely two-handled cooking pots, one-handled cooking jugs and tripod-based cooking pots. Just like RP III, standard shapes and fabrics in the cooking pot repertoire characterise much of the island and share common typological and technological characteristics among different settlements.

The technological assessment of cooking pots and other probable local products within the broader RP and RPC sequences throughout the lifespan of Marki is intended to evaluate their production, the selection of raw materials, their processing and tempering, and the evolution of ceramic recipes in relation to typological changes observed in time until MC II. Following this line of investigation and setting the issue of ceramic technology and ceramic variation through time at the centre of this case study, sampling focused on utilitarian RP and RPC vessels, loomweights, hobs, pans and mealing bins.

In addition to WPP, Early Red Slip (hereafter ERS) is the second ware included in the sample that cannot be characterised as typical at Marki, meaning that it was found only in very small quantities. However, it was included in the sample for a number of reasons; ERS is a ware that until very recently was unknown. Even though

[39] Unfortunately the various publications do not follow a systematic use of the terms Types a and b. In the context of this thesis, the two type references are used according to Frankel and Webb's identification (2006a, 100).

it was distinguished in earlier excavation seasons, it was not mentioned in the first Marki volume (Frankel and Webb 1996; Frankel and Webb 2006a, 140). Ten years later, in the second report of the excavations, this type of pottery was identified with some hesitation as an early form of Red Slip ware (Frankel and Webb 2006a, 140).

ERS was found in EC III to MC I contexts, and was easily distinguished from other contemporary ceramic types due to its stylistic and fabric consistency. It is a very homogeneous type of pottery, made with fine, well-processed clay, fired medium to hard. The orangish slip on the outer surface of the vessels is particularly thin and applied in an irregular way, sometimes leaving the impression that it was wiped rather than applied on the vessels' surfaces by dipping (see also Frankel and Webb 2006a, 140-141).

Parallels to this ware exist in eastern settlements, such as Ayios Iakovos, and at Lapithos to the north. However, the excavators of Marki believe that ERS from the site is somewhat earlier than that of Lapithos and Ayios Iakovos and suggest that it was reaching the settlement in small quantities already in EC III (Frankel and Webb 2006a, 141). The electron microprobe analysis of seven samples by Summerhayes (1996) has already indicated that this type of pottery is not only stylistically, but also chemically and mineralogically homogeneous, high in calcium oxide and characterised by the presence of minerals such as quartz, plagioclase feldspars, pyroxene, ankerite and orthoclase (Summerhayes 1996, 178). Even though these minerals can be found locally in the vicinity of Marki, this does not eliminate a more distant provenance.

Among all the imported wares recorded at Marki, ERS pottery was sampled due to its distinct and very standardised appearance, suggesting that this pottery type was produced in a different context of production. The main aim was to compare EC III-MC II pottery produced at Marki, with contemporary pottery imported to the settlement, and assess the degree of standardisation of probable local and imported fabrics within their own groupings. Ultimately, such an assessment could become suggestive of aspects ceramic production intended for local consumption in comparison with pottery that was produced for inter-settlement distribution.

Finally, it should be stated that in addition to the chronological distribution of pottery, the spatial distribution of pottery at the site was also taken into consideration as a basis for examining differences in ceramic production within the community. Stratigraphic analysis of building structure and history at Marki led to the identification of architectural complexes, or “compounds”. Compounds at Marki vary in size and structure. Some of the compounds are composed of two or three internal rooms with a roof, and an associated courtyard, its borders defined by a wall, while others are smaller or larger in size and without a courtyard (Frankel and Webb 2006a, 30; Frankel and Webb 2006b).

Table IV.3 shows the compounds in use during each period and occupational phase, with sampled compounds highlighted in grey. An attempt was made to include samples from successive phases of single compounds, such as 6 and 7, which show a remarkably prolonged existence, as well as other compounds of the settlement which went in and out of use in different phases. A broadly contextualised sample is one of the pros of this study seeing that Marki is the only EC and MC settlement in Cyprus that provides this potential. Focusing on the main, probably local wares, allowed a larger and more reliable sample, taking advantage of contextual variability in order to explore the social dimension of production and use at the settlement.

It should be noted that **Table IV.3** also includes the Philia samples from Marki that were presented in Chapter III. This presents a complete picture of the sample’s chronological and spatial distribution at the site. In many cases, shape was not the primary concern when sampling an RP sub-variety, but rather the occupational phase or spatial context in which it was found, so that all phases and different contexts of recovery could be represented in the analysed ceramic sample.

Chronological period	**Phase**	**Compound number**
Philia	A	1, 2
Philia	B	1, 3, 4, 5
EC I	C	6, 7, 8, 9, 10, 11, 12
EC II	D	6, 7, 8, 9, 11,12, 13, 14, 15,16,17,18
EC III	E	6, 7, 8, 9, 12, 13, 14, 15, 18, 19, 20, 21, 22
EC III	F	6, 7, 8, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
MC I	G	6, 7, 12, 13, 18, 19, 20, 1, 22, 23, 24, 25, 26, 27, 28, 29
MC I	H	6, 7, 12, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31, 32, 33
MC II	I	Only a couple of rooms – little other activity in excavated area

Table IV.3 Compounds in use during each period and associated occupational phase (Frankel and Webb 2006b, 290-298). Sampled compounds indicated in grey.

Macroscopic descriptions of all analysed samples, provided by Frankel and Webb (2006a), can be found in **Appendix IV.2**. The reference identifier for each sample is comprised by the acronym of the ware to which the sample belongs and the reference number given to it at the time of excavation (e.g. RP-1082). In the case of mealing bins, the sample number is accompanied by the abbreviation CW, meaning coarse ware (e.g. CW-10224), whereas in the case of loomweight and hob fragments, LOOM and HOB respectively precede the samples' numbers (e.g. LOOM-13585 and HOB-3242 – see also Abbreviations table). All samples in this case study come from Marki. In total, 185 samples (including the 39 RPP samples already presented in Chapter III) were selected for analysis. The sample assemblage includes 39 RPP, 16 PRS, 10 WPP, 72 RP, 32 RPCP and RCP, and 8 ERS samples, 4 mealing bin, 2 hob and 2 loomweight fragments (**Appendix IV.1**). As has already been mentioned the analysed samples represent different compounds across the settlement and all the phases of occupation.

IV.2. Marki *Alonia* under the microscope. The analytical dataset.

IV.2.a. The petrographic data.

All 185 samples were prepared as thin sections and were studied under the polarising microscope, following the analytical procedures outlined in Chapter II. The EC-MC samples from Marki were divided into thirteen (**Table IV.4**) fabrics or were categorised as outliers, according to the mineralogical characteristics of the specimens and the density and distribution of the inclusions within their clay matrices. Detailed descriptions of the thirteen identified fabrics are given in **Appendix IV.3**. The terms coarse and fine were used as part of the general description of each fabric, in order to define their degree of coarseness or fineness in relation to the other recorded fabrics. The degree of coarseness or fineness of each fabric was based primarily on the size of the inclusions, and in particular the relative percentages and sizes of coarse and fine fractions (see **Appendix IV.3**).

The first four fabrics in **Table IV.4** are essentially the Philia fabrics I to IV already discussed in Chapter III. They have been incorporated in this case study in order to provide the full picture of ceramic production and distribution during the Philia period at Marki, and in order to compare them with chronologically later fabrics, to assess fabric (dis)continuities, and to record any overlapping between fabrics and wares. The detailed mineralogical descriptions for Philia fabrics I to III are not repeated in this section as these are described in Chapter III (section III.3.a), and their full fabric descriptions can be found in both **Appendix III.2** and **Appendix IV.3**. In this case study Philia fabric IV expands chronologically to incorporate a large number of samples, therefore it is described together with the other fabrics identified for the purposes of this study.

Fabric I: Micritic limestone rich fabric with few fragments of chert and TCFs	**Overall %**
RPP-3570, RPP-7229, RPP-7428, WPP-7709, RPP -8789, RPP-8962, PRS-9121, RPP-9369, RPP-9496, RPP-9999, RPP-13067, RPP-13143, WPP-13529, RPP-14228, RPP-14361, RPP-14370, WPP-15242, RPP-15316, RPP-15337, RPP-16438, RPP-16444, RPP-16486, RPP-16511, RPP-16733 (24 samples)	13%
Fabric II: Igneous Fabric with some calciferous material	**Overall %**
RPP-5096, RPP-5104, RP-5862, RP-7173, RP-7320, RP-7464, RPP-9117, CW-9207, PRS-10234, RP-11359, RP-12361, RPP-12371, RP-12841, RP-12944, RPP-13085, RP-14313, WPP-14401, RP-14961, RP-14963 RPP-16408, RPP-16480, RPP-16530 (22 samples)	12%
Fabric III: Igneous Fabric with some micritic limestone fragments and microfossils, and frequent presence of ACFs	**Overall %**
RPP-4258, PRS-9642, PRS-9724, RPP-12213, PRS-12215, RPP-14279, PRS-14323, RPP-15309, PRS-16532, PRS-16533 (10 samples)	5%
Fabric IV: Biotite mica rich fabric with various igneous inclusions	**Overall %**
CW-3726, RPP-5094, RP-7216, RP-7308, RP-7314, RP-7316, RPP-7427, PRS -7471, WPP-7761, PRS-9173, CW-9186, RPP-10101, CW-10224, RP-10242, RP-12473, RP-12800, RPC-12940, RPC-13016, RP-14097, RP-14225, RP-14379, RPC-15163, RPC-15305, RPC-15640, RP-15646, RPC-16175, RP-16203, RP-16541, RP-16543, RP-16562 (30 samples)	16%
Fabric V: Micritic limestone rich fabric with few chert fragments	**Overall %**
Samples: RPC-7437, RPC-10210, RPC-10212, RPC-13105, RPC-13140, RPC-15301, RPC-15303, RPC-15638 (8 samples)	4%
Fabric VI: Micritic fabric with igneous inclusions	**Overall %**
HOB-3242, RP-7307, HOB-13262, LOOM-13585, LOOM-13829, RP-14262 (6 samples)	3%
Fabric VII: Fine fabric with microfossils and some igneous inclusions	**Overall %**
RP-4864, ERS-6416, RP-12359 (3 samples)	2%
Fabric VIII: Biotite, polycrystalline quartz and metaquartz rich fabric	**Overall %**
RPC-1089, RP-5826, RPC-6128, RPC-6453, RPC-7193, RP-7300, RPC-7493, RPC-9062, RPC-9176, RP-9200, RPC-9243, RP-9248, RP-11477, RPC-11478, RPC-12458, RPC-12823, RPC-12942, RP-12954, RP-13007, RPC-13147, RPC-14347, RPC-15183, RPC-15382, RP-15450, RP-15770, RPC-16194, RPC-16395, RP-16499, RPC-16677 (29 samples)	16%
Fabric IX: fine fabric with organic matter, quartz, biotite and other igneous inclusions	**Overall %**
RP-1082, RP-7359, RP-14958, RP-15481 (4 samples)	2%

FABRIC X: FINE FABRIC ENRICHED WITH BIOTITE	Overall %
RP-5770, RP-6365, RP-7208, RP-7278, RP-7301, RP-11341, RP-12239, RP-12933, RP-14204 (9 samples)	5%
FABRIC XI: DOLERITE AND FELDSPAR RICH FABRIC	**Overall %**
RP-9242, RP-14377 (2 samples)	1%
FABRIC XII: FINE FABRIC WITH ONLY A VERY SMALL NUMBER OF INCLUSIONS	**Overall %**
RP-3265, RP-3305, RP-3609, RP-4351, RP-7256, RP-12193, RP-14053 (7 samples)	4%
FABRIC XIII: FINE FABRIC – TOTAL ABSENCE OF DISCRIMINATING PETROLOGY	**Overall %**
ERS-5812, ERS-11353, ERS-11482, ERS-12353, ERS-12456, ERS-15739, ERS-16534 (7 samples)	4%
REDUCED IGNEOUS FABRIC	**Overall %**
PRS-14338, PRS-16466, PRS-16549 (3 samples)	2%
Outliers	**Overall %**
RP-1099, RP-7199, RPP-7412, WPP-8551, WPP-9112, RPP-9398, RP-12372, RP-12811, RP-13025, PRS-14280, RP-14354, WPP-14604, RP-14957, PRS-15277, RPP-15461, RP-15649, RP-16199, WPP-16234, RPP-16452, PRS-16477, WPP-16513 (21 samples)	11%

Table IV.4. The Philia-MC fabrics as defined by petrography (see also **Appendix IV.3** for full fabric descriptions).

As has already been explained in Chapter III, fabric I is a very distinctive fabric characterised primarily by the presence of metamorphic minerals and rocks, such as chert (**Figure III.8. a-d**), quartzite (**Figure III.9**), and some rare laths of muscovite mica (**Figure III.10 a-b**). In addition to the metamorphic elements, micritic limestone is also one of the primary components of fabric I (**Figure III.11 a-d**). Tcfs is another distinguishing feature of this fabric, and together with limestone are the only types of inclusion in relatively large sizes (limestone reaches 5.4 mm in long diameter and tcfs 2 mm in long diameter, **Figure III.12 a-b**).

Fabrics II and III are very similar and share many common characteristics. Overall, as has been argued in the preceding chapter, the raw materials for the production of fabrics II and III were collected from similar or adjacent clay sources within the same broad geological region. These are coarse, calcareous fabrics compositionally very similar between them. Fabrics II and III are both characterised by the coexistence of sedimentary and igneous inclusions in their compositions (**Figures III.16, III.17, III.20, III.21**). However, they are distinguished into two different fabrics due to the greater density of igneous inclusions in fabric III and the more distinct presence of microfossils within the micritic limestone fragments of fabric II. While the limestone fragments in fabric II contain microfossils, the limestone fragments in fabric III contain various inclusions, such as plagioclases, serpentine, biotite, and only in rare cases some microfossils.

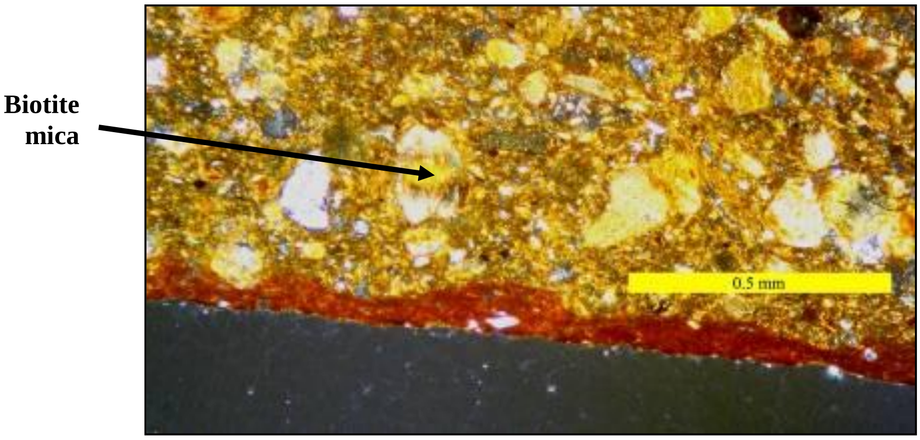


Figure IV.2. The predominance of biotite mica in RP-14379, fabric IV (XP, full scale: 0.5 mm).

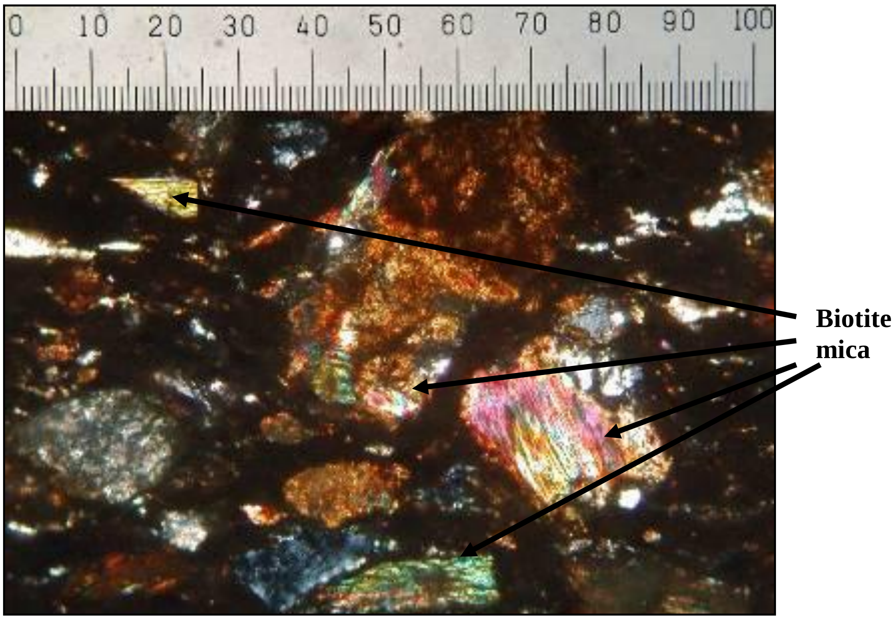


Figure IV.3. Biotite mica is the predominant mineral in the clay matrix of RP-10242, a sample which is made with fabric IV (XP, full scale: 1mm).

In contrast to the aforementioned fabrics I, II and III, all of which have a strong sedimentary character, fabric IV is made primarily of igneous materials, characterised by almost a total absence of any calciferous inclusions. Fabric IV is one of the two most abundant fabrics in the Marki sample; the Philia examples are essentially predecessors of one of the major BA fabrics at the site. This is a coarse, very distinct fabric, easily differentiated from all other fabrics in the sample due to the predominant presence of biotite mica in the clay matrices (**Figures IV.2, IV.3, IV.4**). This is a relatively homogeneous fabric with a strong igneous nature. In addition to biotite mica, other dominant igneous components include basalts and more rarely gabbros, dolerites, clinopyroxenes and orthopyroxenes (**Figures IV.5, IV.6**). Many of the rocks and minerals in this fabric are altered (**Figure IV.5**), and in some cases there are some reduced areas in the sections, especially where on the outside exterior surface of the corresponding vessels there is mottling. In some rare cases micritic inclusions and micofossils can also be seen, but in general, fabric IV is a non-calcareous fabric, with a minimal presence of calciferous material.

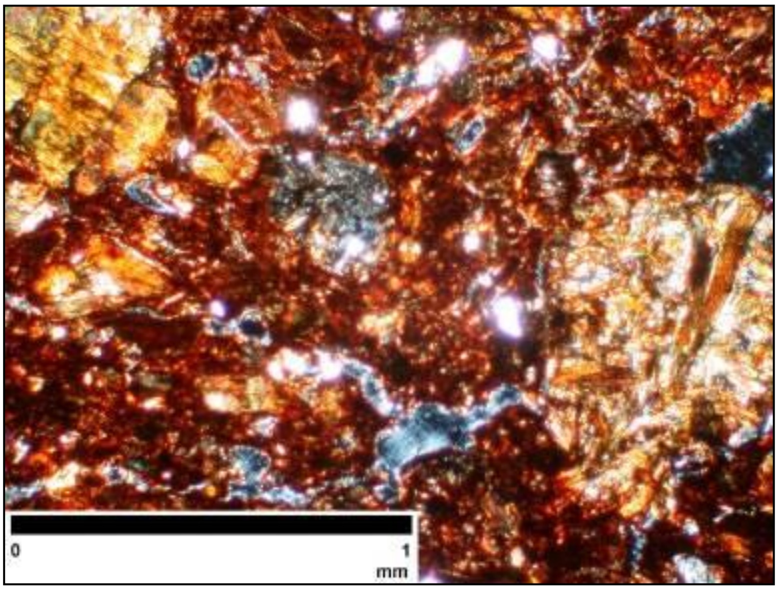


Figure IV.4. The predominant presence of biotite mica in RPC-15163 (XP, full scale: 1mm).

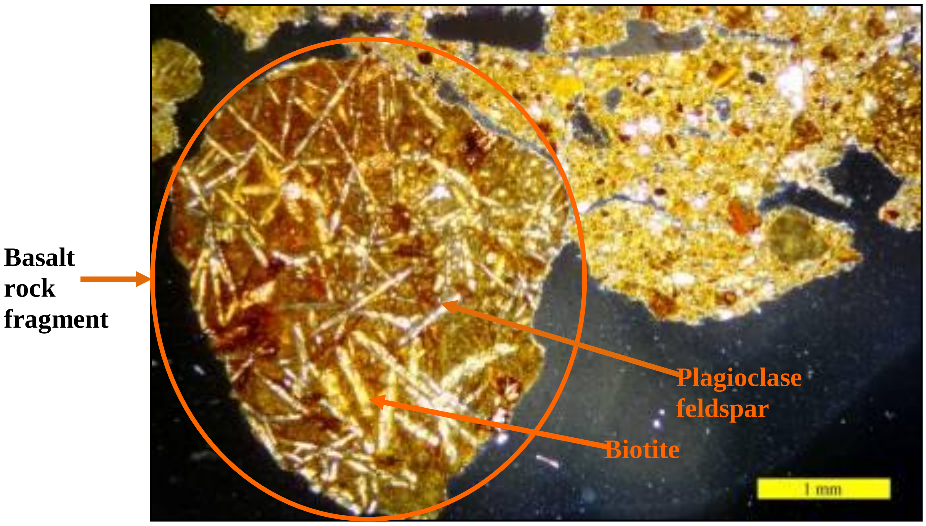


Figure IV.5. A large fragment of basalt in the clay matrix of CW-9186. Some of the plagioclase feldspars in the dark, fine-grained rock are altered to biotite mica (XP, full scale: 1mm).

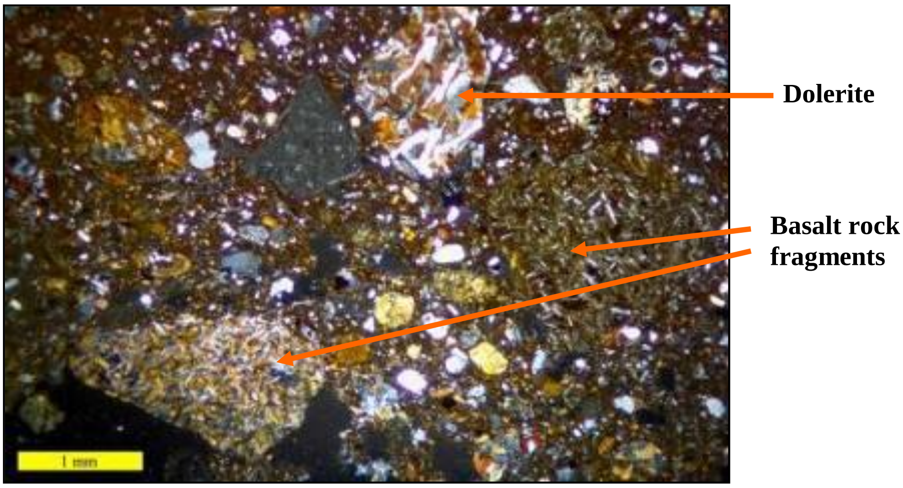


Figure IV.6. Two fragments of basalt and a fragment of dolerite in RPC-13016 (XP, full scale: 1mm).

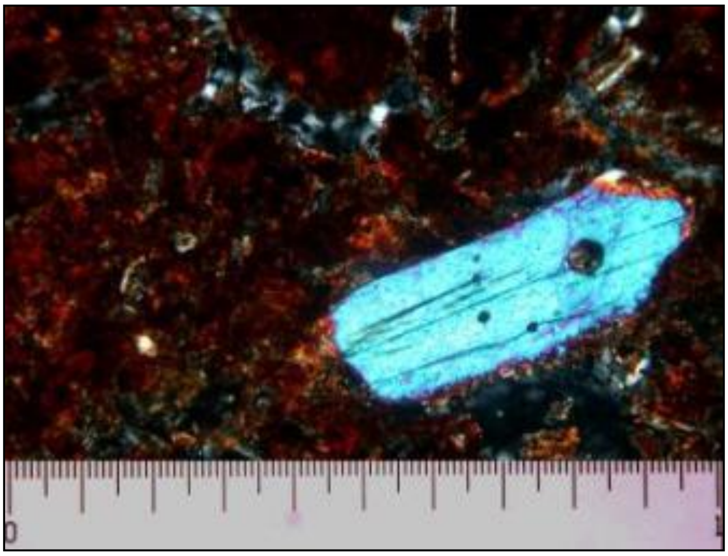


Figure IV.7. A fragment of clinopyroxene in soil sample no. 4 (XP, full scale: 1mm).

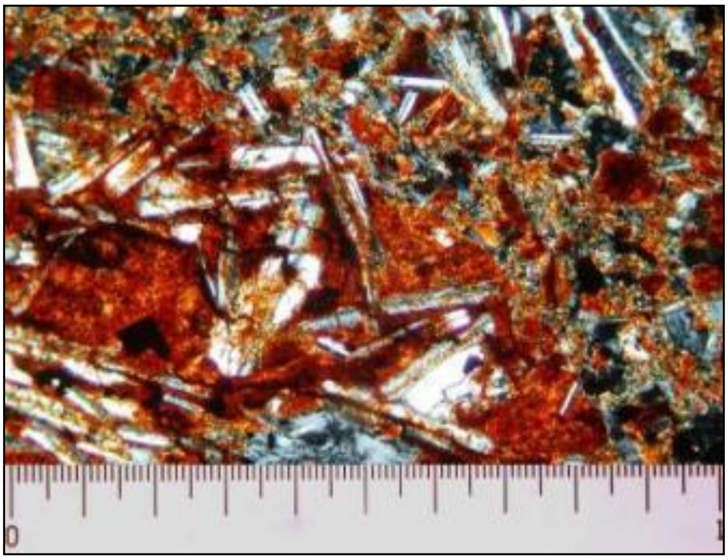


Figure IV.8. Plagioclase feldspars forming part of dolerite fragments in soil sample no. 10 (XP, full scale: 1mm).

It should be noted that igneous components such as those recorded in fabric IV were also observed in the mineralogical composition of almost all the soil samples collected from the vicinity of Marki (**Figures IV.7** and **IV.8**), but none of the soil samples shows the predominant presence of biotite mica seen in fabric IV, and none of the soil samples can be confidently associated mineralogically with fabric IV. From a technological point of view, the size of the inclusions in fabric IV is very similar to those in the soil samples, which were shaped into briquettes and fired without any prior processing of the soils. This similarity in inclusion size among the samples made with fabric IV and the unrefined soil samples, suggests that there was little, if any, raw material refinement in the production sequence of the corresponding vessels, which could be restricted to hand picking the largest inclusions and organic matter visible to the naked eye.

The samples made with fabric V form a very homogeneous group, and they were straightforwardly distinguished by their distinct mineralogical characteristics, which are not met in any of the other fabrics. The predominant type of inclusion in fabric V is micritic limestone. In this fabric, and in contrast to the other fabrics, the micritic limestone fragments are evenly distributed across the clay matrices, following a size mode around 0.5 mm in long diameter (**Figure IV.9**), even though larger and smaller sized fragments are also observed. Fabric V also presents some metamorphic characteristics in the form of chert, quartzite and quartzite-schist fragments (**Figures IV.9** and **IV.10**), which were not recorded in any other fabric in this case study. Muscovite mica is also recorded in this fabric even though in rare, small laths. The number of igneous inclusions is very restricted and it is confined to very few plagioclase feldspars.

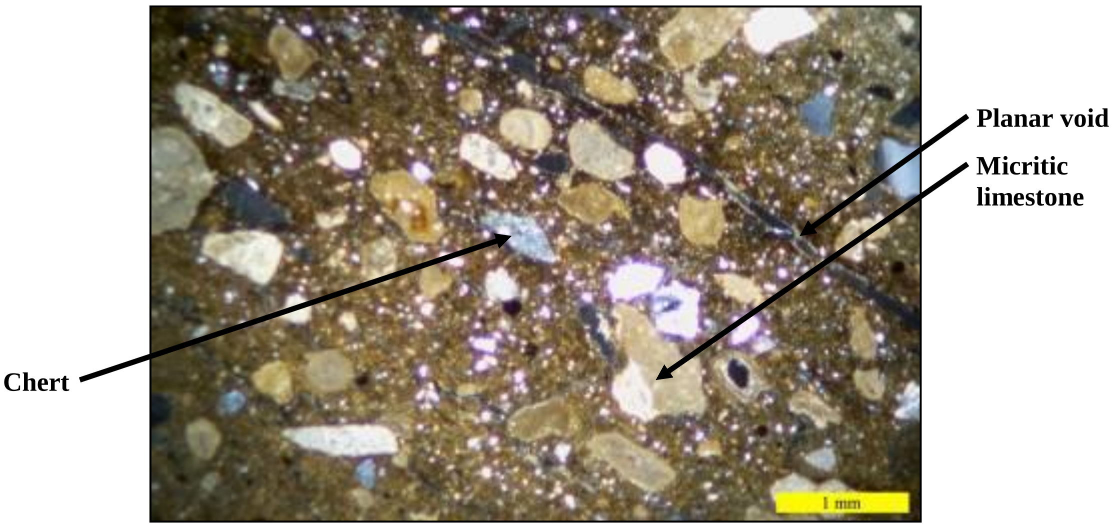


Figure IV.9. RPC-15301 is made with fabric V (XP, scale: 1mm).

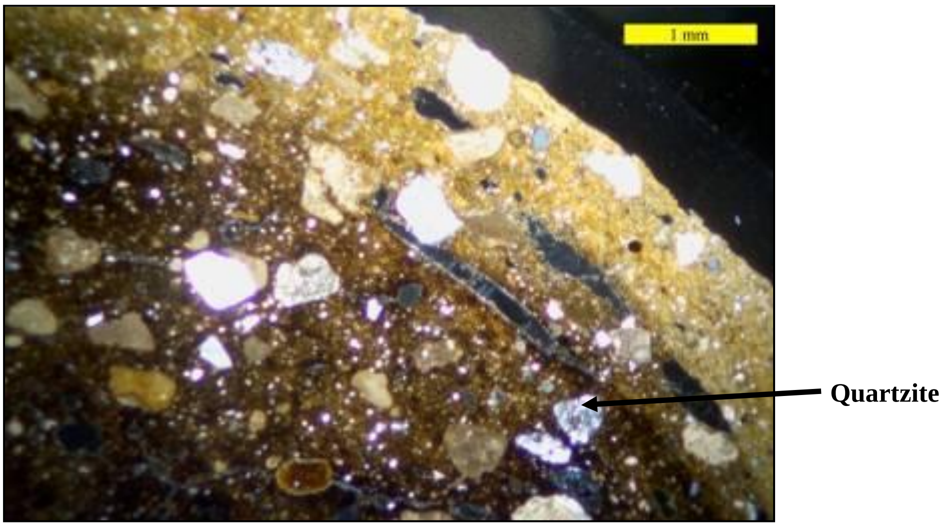


Figure IV.10. RPC-10210 is made with fabric V (XP, scale: 1mm).

From a technological point of view, the presence of dark brown cores in comparison to the lighter colours of the vessels' margins suggests that the temperatures at which these vessels were fired were not high enough or were not kept high for long enough for thorough oxidation. Moreover, the planar voids and channels, parallel to the vessels' margins (**Figure IV.9**) suggest the presence of organic matter, which was burnt-out during firing. Despite the predominant presence of micritic limestone in its composition, fabric V is one of the hardest fabrics from Marki, its hardness reaching levels 3 and 4 (calcite and fluorspar respectively) on Moh's hardness scale.

In terms of technology, it seems that the micritic limestone fragments are artificially added, rather than being natural constituents in fabric V. Whereas in most cases, tempering material is identified by the sharp angularity of its grains, due to crushing into small fragments or powder before tempering (Rye 1981, 52; Hodges 1993; Rice 1987), in the case of fabric V, tempering material seems to be naturally abraded, and thus less angular, sub-rounded, and rounded limestone fragments seem to have been used as tempering material. The frequency of this type of inclusion, their density, homogeneous distribution, and standard size mode across the sections of all the samples allocated to group V (**Figures IV.9** and **IV.10**), suggest that they were added by potters, rather than being naturally residual in the clay.

According to Dickinson (2006, 20), sand tempers can be collected from both beaches and streams. Beach tempers tend to be well-sorted, and variably rounded, most commonly sub-rounded to sub-angular, whereas stream sand tempers are only moderately sorted with sub-angular to sub-rounded grains (Dickinson 2006, 20). Considering this information and the relatively well-sorted occurrence of limestone inclusions in fabric V, it appears likely that this fabric was tempered with beach sand. Descriptions of beach sand in thin section where carbonates form the predominant constituent of the material, with common to few cherts, opaques and even fewer rock fragments, such as igneous mafic minerals (Boileau *et. al.* 2010, 1679, compare also Fig. 3b, 1682 with **Figures IV.9** and **IV.10**), agree well with the mineralogical characteristics of fabric V, and strengthen the argument that it was tempered with beach sand.

Fabric VI is made with micritic clay and is characterised by the predominant presence of micritic limestone fragments and calcite-filled microfossils (**Figures IV.11, IV.12 and IV.13**). These microfossils (**Figures IV.12 and IV.13** are found both within the limestone fragments and across the clay matrices. The sun-dried hob and loomweight samples have a yellowish white colour under plain polars (PPL) and a yellow colour under crossed polars (XP), and in both cases lighter colours than the stronger brown colours in PPL and XP of the fired ceramic samples. Apart from this colour difference, all samples allocated to this fabric share common mineralogical characteristics.

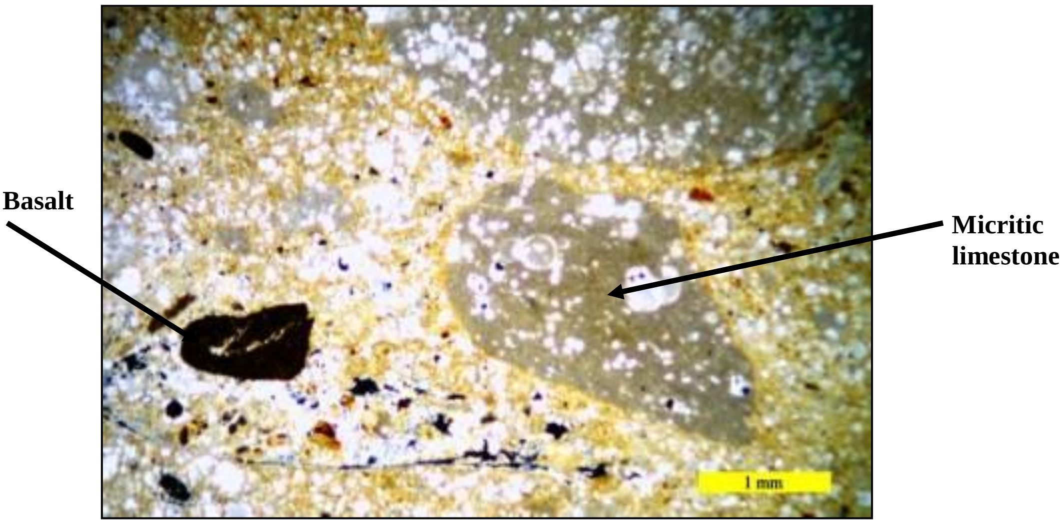


Figure IV.11. The predominant presence of micritic limestone and calcite filled microfossils, and their coexistence with basalt fragments in HOB-13262, which is made with fabric VI (XP, full scale: 1mm).

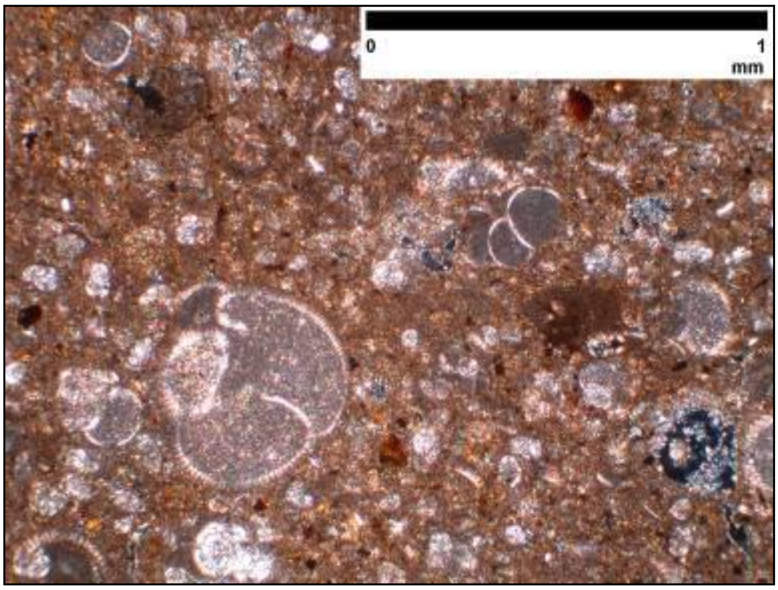


Figure IV.12. The predominant presence of calcite-filled microfossils in fabric VI, as seen in LOOM-13262 (PPL, full scale: 1mm).

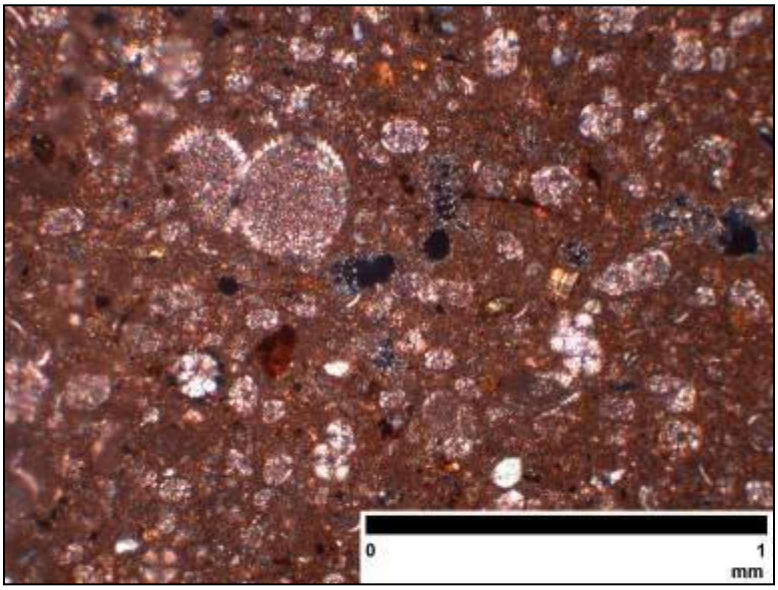


Figure IV.13. The predominant presence of calcite-filled microfossils in fabric VI, as seen in LOOM-13585 (PPL, scale: 1mm).

In fabric VI, the calciferous material coexists with igneous inclusions, such as basalts, plagioclase feldspars and pyroxenes (**Figures IV.11, IV.14, IV.15**). Sedimentary and igneous inclusions coexist both in coarse and fine fraction. However, the sedimentary inclusions, and in particular the micritic limestone fragments, are the largest constituents in size, reaching the size of granules, around 3 mm in long diameter. Fabric VI is considered one of the coarsest fabrics in the Marki sample.

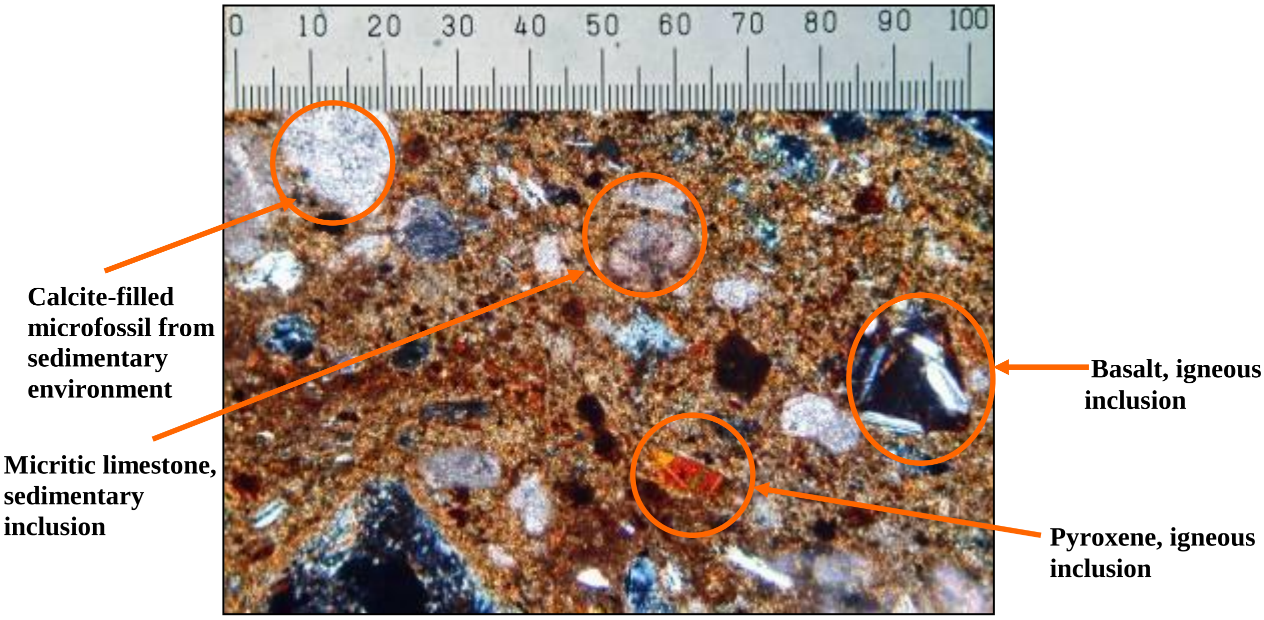


Figure IV.14. Sample RP-14262 shows the coexistence of sedimentary and igneous inclusions in fabric VI (XP, full scale: 1mm)

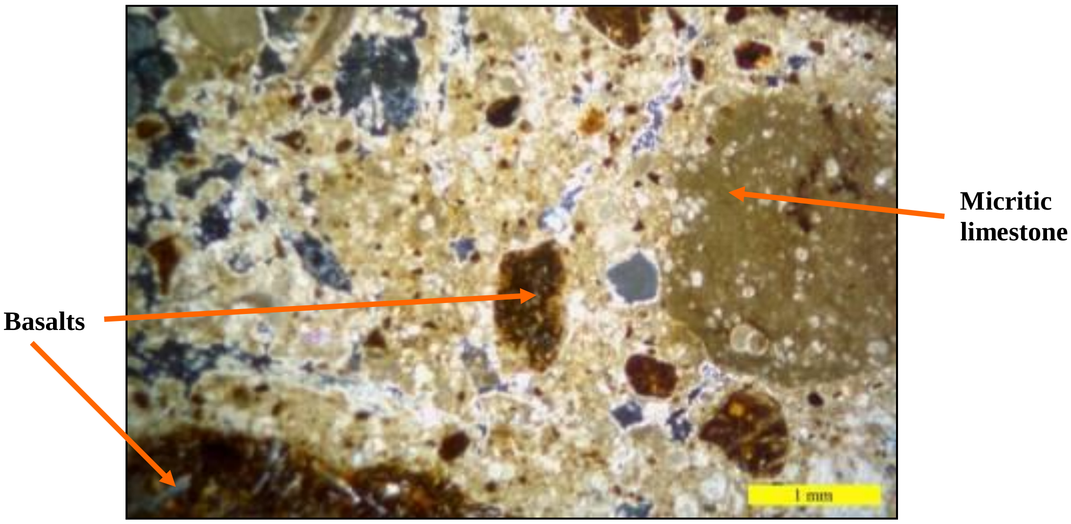


Figure IV.15. Sample HOB-3242 shows the coexistence of sedimentary and igneous inclusions in fabric VI in both coarse and fine fractions (XP, full scale: 1mm)

Clay striations, which in thin sections are used as evidence for clay mixing, were recorded in sample RP-7307 (**Figure IV.16**). These clay striations look like red veins in the clay matrix and do not follow a particular pattern. Clay mixing could be the result of natural processes, weathering and intermixing of materials, or it can be done artificially by the potter. In this particular case, considering the diverse character of fabric VI, where sedimentary and igneous materials coexist, it is argued that clay mixing is a result of natural intermixing. It seems that the materials used for the production of fabric VI were collected from alluvial deposits by a river, where the flow of water interblended a series of differing materials.

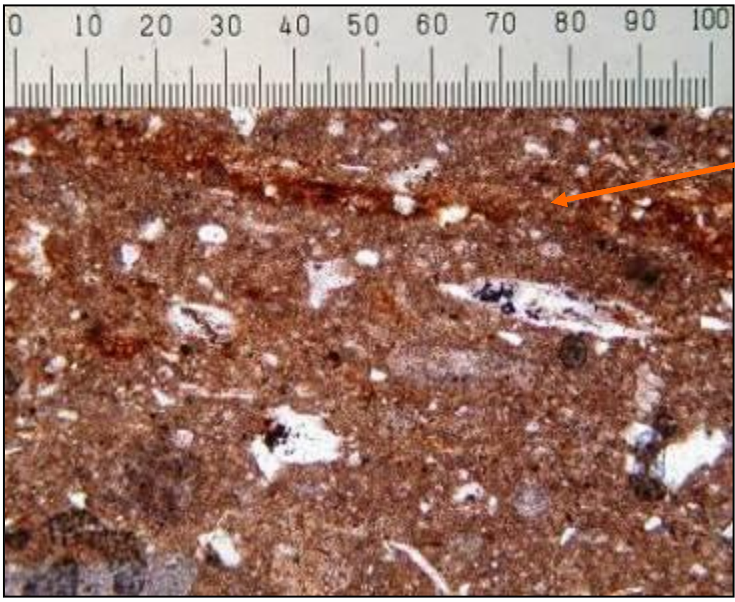


Figure IV.16. The presence of clay striations in RP-7307 (PPL, full scale: 1mm)

The presence of clay striations in one of the soil samples (**Figure IV.17**) collected from the vicinity of Marki supports further the argument that clay mixing was achieved by natural processes and the continuous movement of rivers, combining various materials, rather than by human activity. **Figure IV.17** shows the clay striation recorded in soil sample no. 2 (**Appendix 1**), from a location close to the Kotsiatis dam, north of the village of Analiontas and south of Marki. Soil sample no. 2 is light brown, uniform silty sand, coming from an alluvial deposit (G. Petrides, pers. comm.; **Appendix 1**).

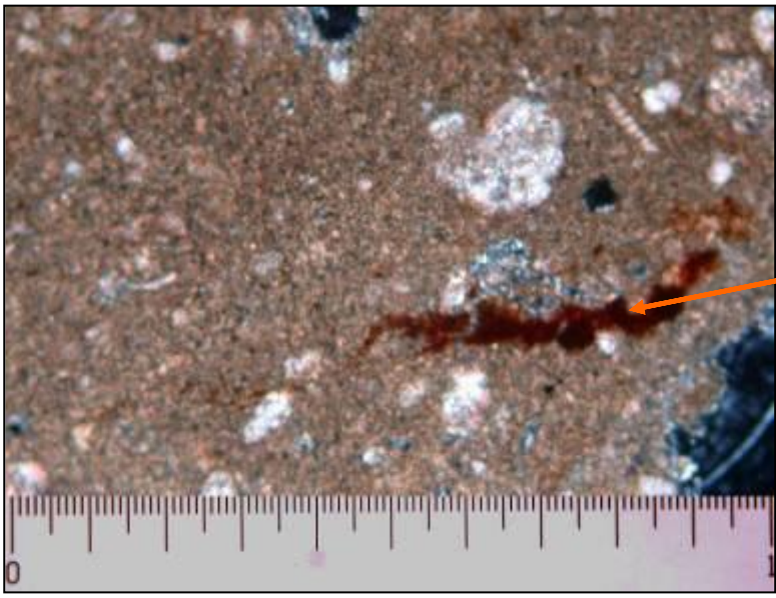


Figure IV.17. The presence of a clay striation in soil sample no.2 (XP, full scale: 1mm).

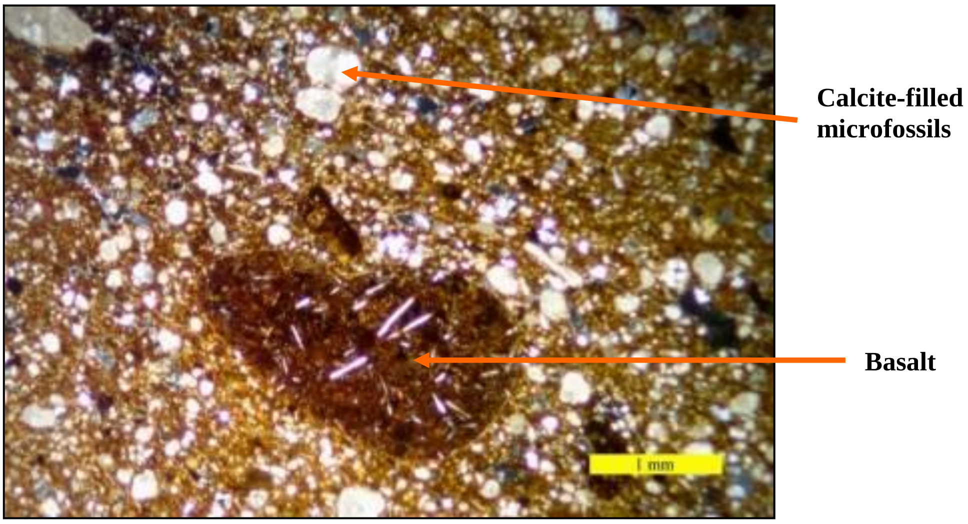


Figure IV.18. Calcite-filled microfossils encircle a fragment of basalt in the clay matrix of RP-12361, made with fabric II (XP, full scale: 1mm).

Fabric VI is very similar to fabrics II and III but relatively coarser. The main differences include the smaller sizes of the inclusions present in fabrics II and III, and the lower densities of micritic limestone also in fabrics II and III. Apart from these differences, the three fabrics share common mineralogical characteristics. All fabrics are characterised by the presence of calcite-filled microfossils (**Figures IV.14** and **IV.18**), an indication that the raw materials for the production of these fabrics could belong to a common originally marine environment. Moreover, just like fabrics II and III, fabric VI is characterised by the coexistence of sedimentary igneous materials, such as basalts, biotite mica, plagioclase feldspars and pyroxenes (**Figures IV.11, IV.14, IV.15**, **IV.19** and **IV.20**).

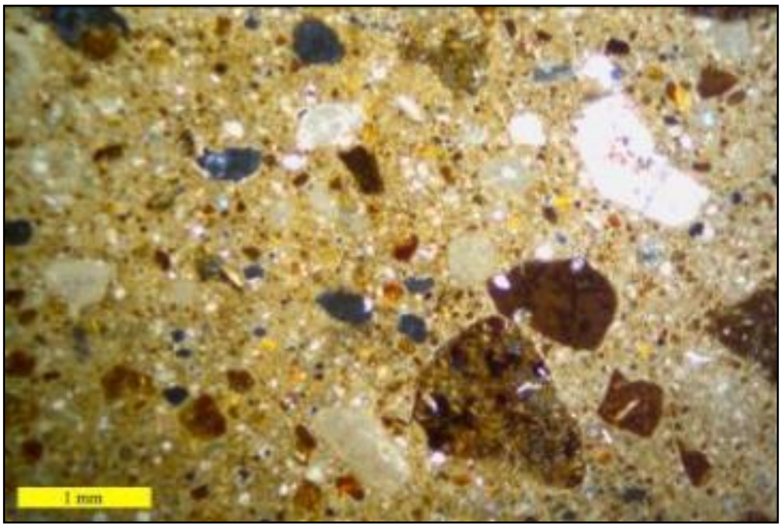


Figure IV.19. The coexistence of sedimentary and igneous materials in CW-9207, which is made with fabric II (XP, full scale: 1mm).

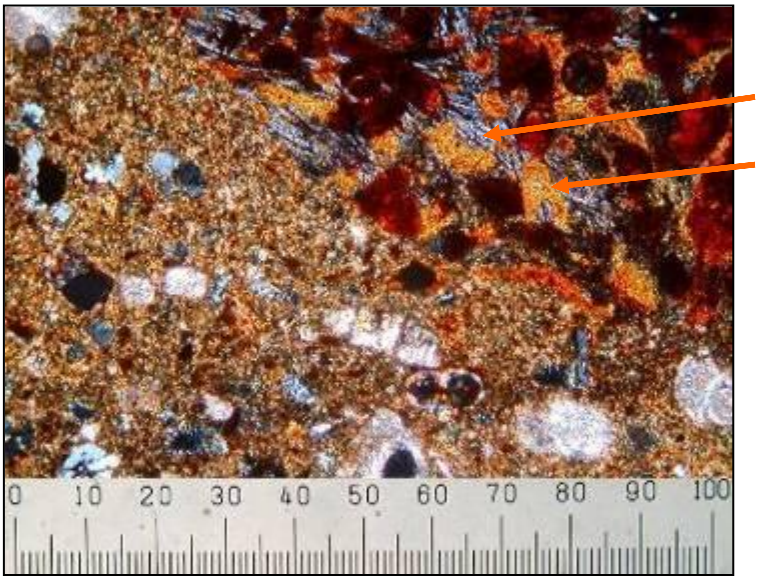


Figure IV.20. A large fragment of basalt in RP-11359, a sample which is made with fabric II. The basalt rock fragment includes plagioclase feldspars and biotite mica (XP, full scale: 1mm).

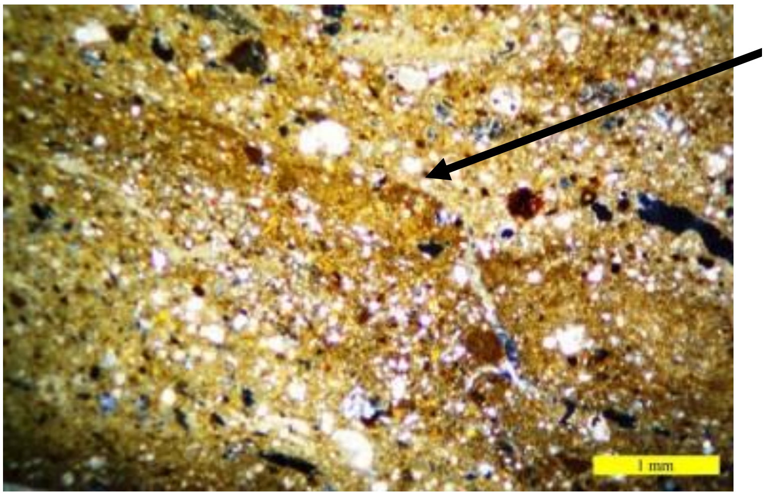


Figure IV.21. A very thin clay striation and the differing areas in the clay matrix of RP-7173, which is made with fabric II, suggest some kind of clay mixing (XP, full scale: 1mm).

Figure IV.21 shows a very thin clay striation in the clay matrix of RP-7173, a sample which is made with fabric II. Moreover, two differing areas can be observed in the clay matrix of RP-7173. Underneath and along the clay striation, almost in the centre of **Figure IV.21**, there is a clay stripe darker in colour, where the presence of microfossils and small calcite fragments is not so dense as in the surrounding parts of the section. These suggest some kind of clay mixing, which as in the case of fabric VI, could be the result of natural intermixing of materials, and the derivation of fabric II from an alluvial deposit.

Two sherds belonging to RP and ERS wares and a third which belongs to the RP black-topped sub-variety compose fabric VII, which is distinguished by fine clay matrices with very few small inclusions (**Figure IV.22**). The dominant inclusions in fabric VII are microfossils, even though other species are also present, and more infrequently some fragments of basalt and biotite, and even rarer, some clinopyroxene and plagioclase feldspars (**Figure IV.23**). While there are the same types of igneous inclusions in this fabric as in fabrics II, III and VI, the coexistence of open and calcite-filled microfossils, and especially their coexistence with other microfossil species, is good evidence that the raw materials of the corresponding vessels should be sought in a different geological environment. Moreover, the fineness of fabric VII, in comparison with the coarser fabrics II, III and VI, indicates that different techniques were used for their production.

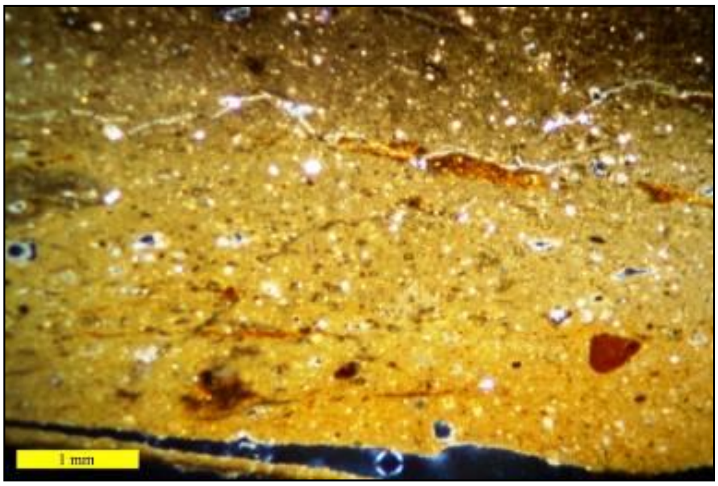


Figure IV.22. RP-12359 is made with fine fabric VII (XP, full scale: 1mm).

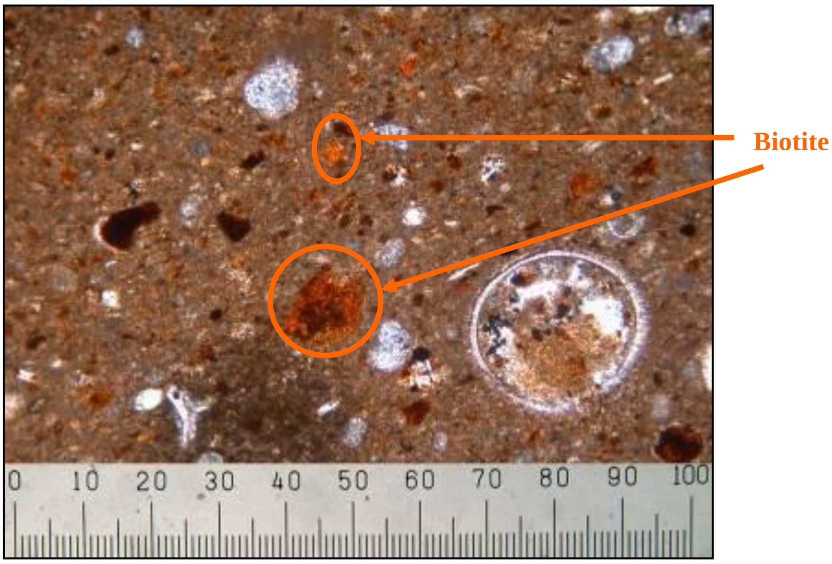


Figure IV.23. Some small widespread biotite fragments in the clay matrix of ERS-6416. This sample is made with fabric VII (PPL, full scale: 1mm).

In terms of production techniques, the colour uniformity across the sections, the constant yellowish brown colour of all the samples in XP and the absence of voids and blackened areas, suggest the absence of organic matter in the groundmasses of the samples made with fabric VII and that this fabric was fired in different firing atmosphere and/or at different firing temperatures than fabrics II, III and VI. Finally, clay striations were recorded in all samples made with fabric VII (**Figure IV.22**). In contrast to fabrics II and VI, however, there is no evidence to suggest whether clay mixing was a result of human activity or natural processes.

Fabric VIII is another distinct, coarse fabric. Fabric VIII is differentiated from all the other fabrics due to the predominant presence of monocrystalline and polycrystalline quartz and metaquartz in its composition (**Figures IV.24.a-b** and **IV.25**). In addition, this fabric is characterised by the frequent presence of various igneous rocks and minerals, such as basalts, dolerites, pyroxenes, plagioclase feldspars, and olivine, and the very restricted presence of calciferous material (**Figures IV.26, IV.27** and **IV.28**). Similarly to fabric IV, fabric VIII consists of igneous materials; however, the occurrence of biotite mica in fabric VIII is not so dense, and there is a higher occurrence of monocrystalline and polycrystalline quartz and metaquartz (**Figure IV.25** contra **Figures IV.2, IV.4**). The low degree of metamorphism observed in fabric VIII, and reflected in the presence of metaquartz, is also not so evident in fabric IV.

The mode of distribution of the monocrystalline and polycrystalline quartz fragments, their degree of angularity, their wide-ranging sizes and poor sorting (**Figures IV.24.a** and **IV.25**) indicate that these minerals occurred naturally in the clay, and were not artificially added by the potters. Especially, the sub-angular shape of most quartz grains could be used as evidence that they occurred naturally in fabric VIII. The solid nature of this material makes crushing essential for reducing the size of the particles, producing sharp angular fragments (Rye 1981, 37). Angular grains occur also in recently deposited sand (Rye 1981, 37); in this case, the absence of sharp angular quartz fragments in fabric VIII indicates that it was not purposefully tempered.

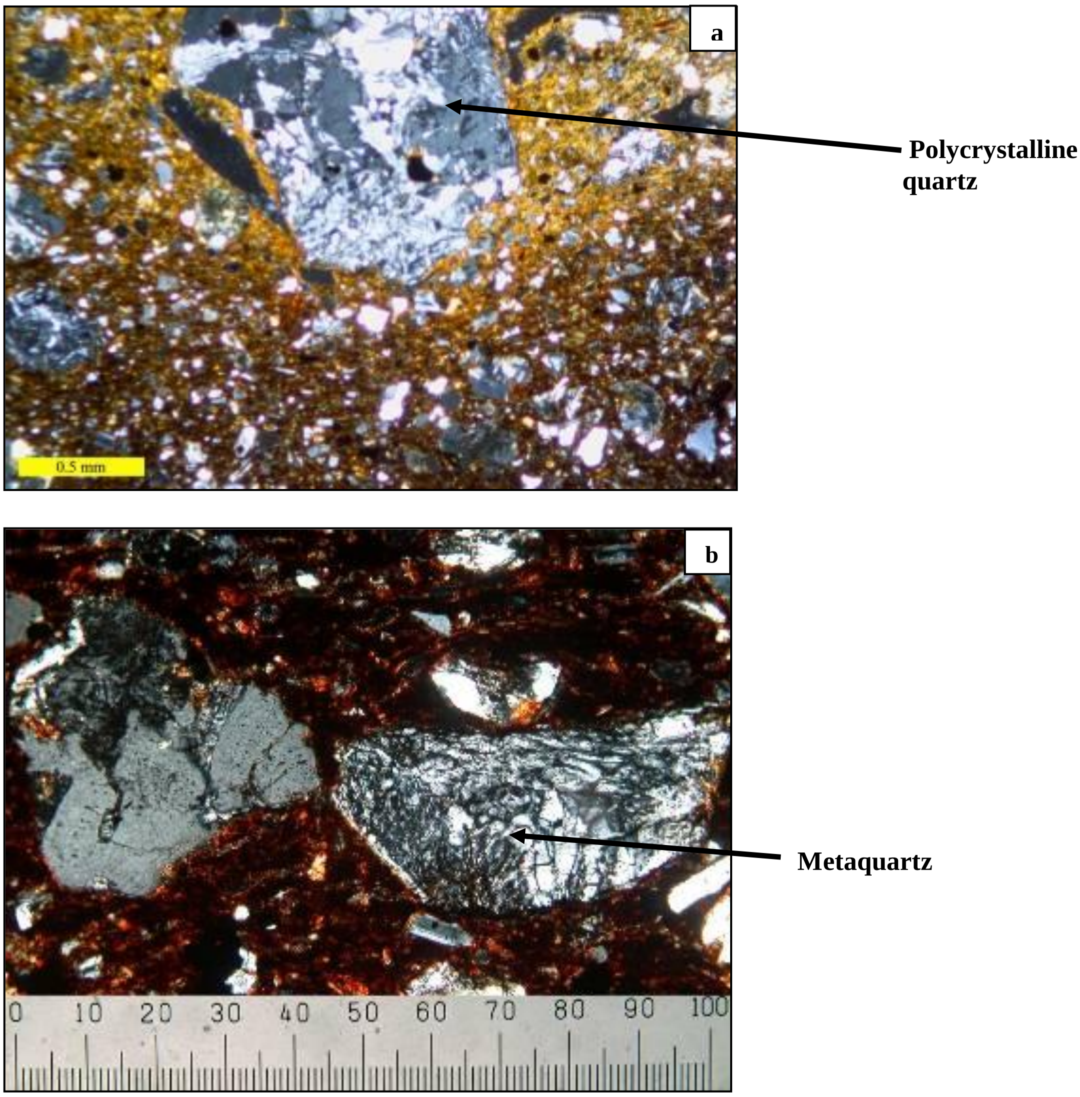


Figure IV.24. RPC-12823 (illustrated in both **a** and **b**) is made with fabric VIII**,** which is characterised by the predominant presence of monocrystalline and polycrystalline quartz and metaquartz (XP, full scales: 0.5 mm and 1mm).

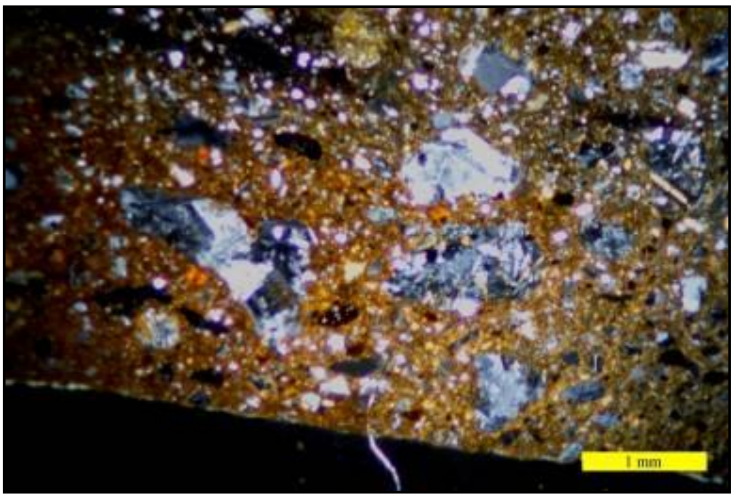


Figure IV.25. RPC-1089 is made with fabric VIII**,** which is characterised by the predominant presence of monocrystalline and polycrystalline quartz and metaquartz (XP, full scale: 1mm).

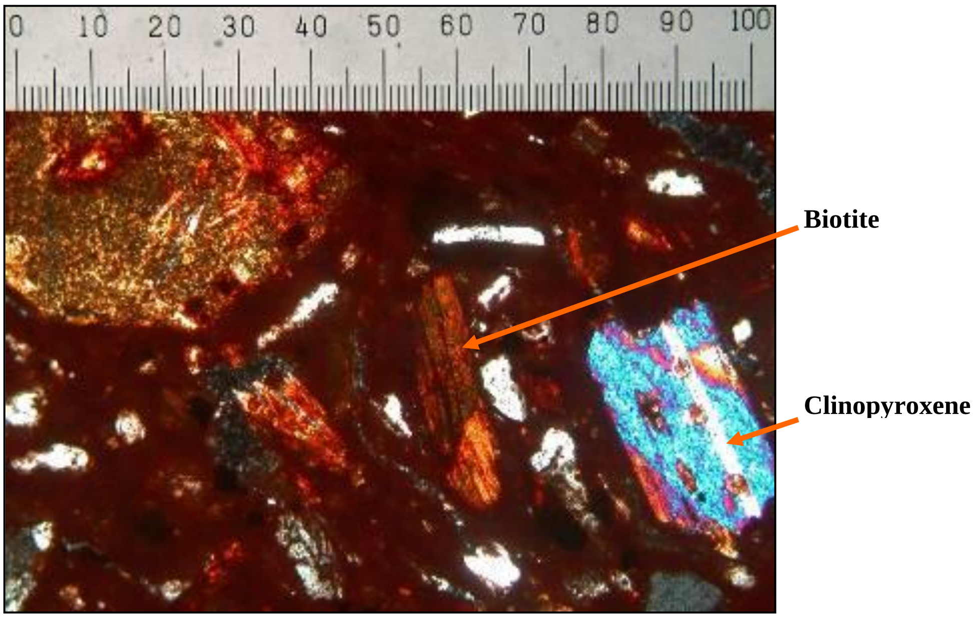


Figure IV.26. A fragment of clinopyroxene and some fragments of biotite mica in RP-11477 from fabric VIII (XP, full scale: 1mm).

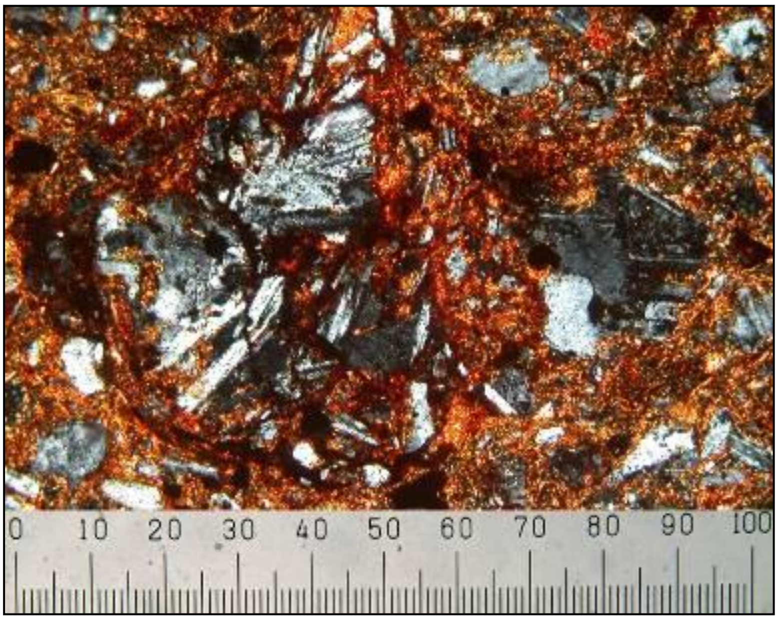


Figure IV.27. A fragment of dolerite, and fragments of plagioclase feldspar and monocrystalline quartz in RP-13007 from fabric VIII (XP, full scale: 1mm).

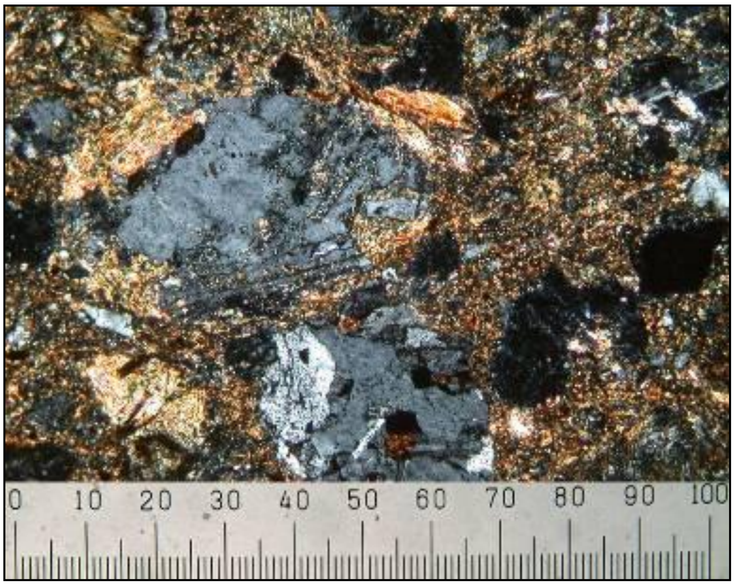


Figure IV.28. Biotite mica and polycrystalline quartz in the composition of RPC-13147 from fabric VIII (XP, full scale: 1mm).

Fabric IX is a fine fabric, without any type of mineral or rock inclusion predominating in its composition (**Figure IV.29**). The most frequent mineral in this fabric is monocrystalline quartz (**Figure IV.30**), while small fragments of micritic limestone, biotite mica, calcite, pyroxene, polycrystalline quartz and plagioclase feldspars were also recorded but with less frequency (**Figure IV.31**). All these inclusions rarely exceed 0.2 mm in long diameter, representing a relatively well-sorted fabric. Another distinguishing feature of fabric IX are the reduced areas around the circumference of voids, suggesting the presence of organic matter that burnt out during firing (**Figures IV.29, IV.30** and **IV.31**).

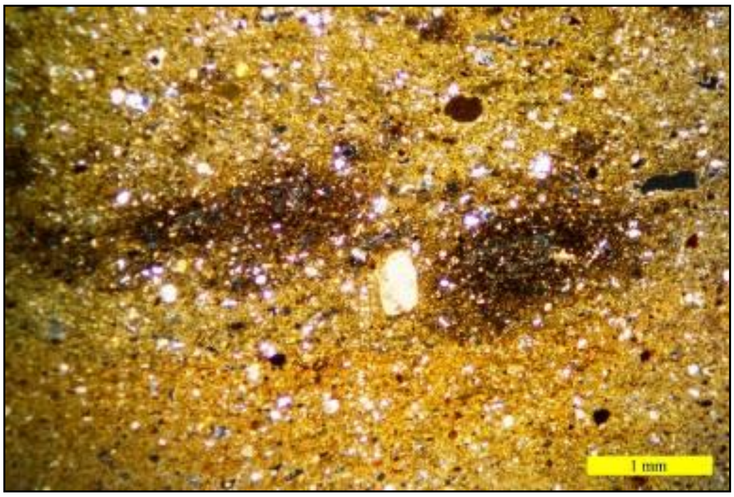


Figure IV.29. RP-14958 is made with fabric IX (XP, full scale: 1mm).

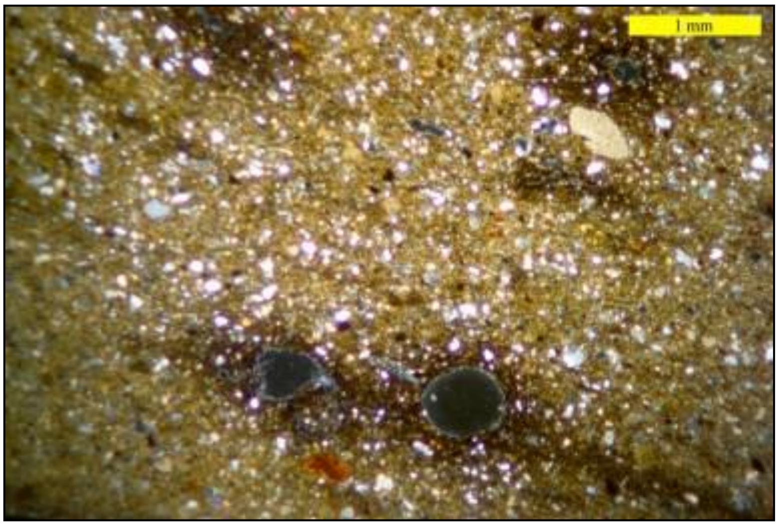


Figure IV.30. RP-15481 is made with fabric IX. The numerous white grains are quartz fragments (XP, full scale: 1mm).

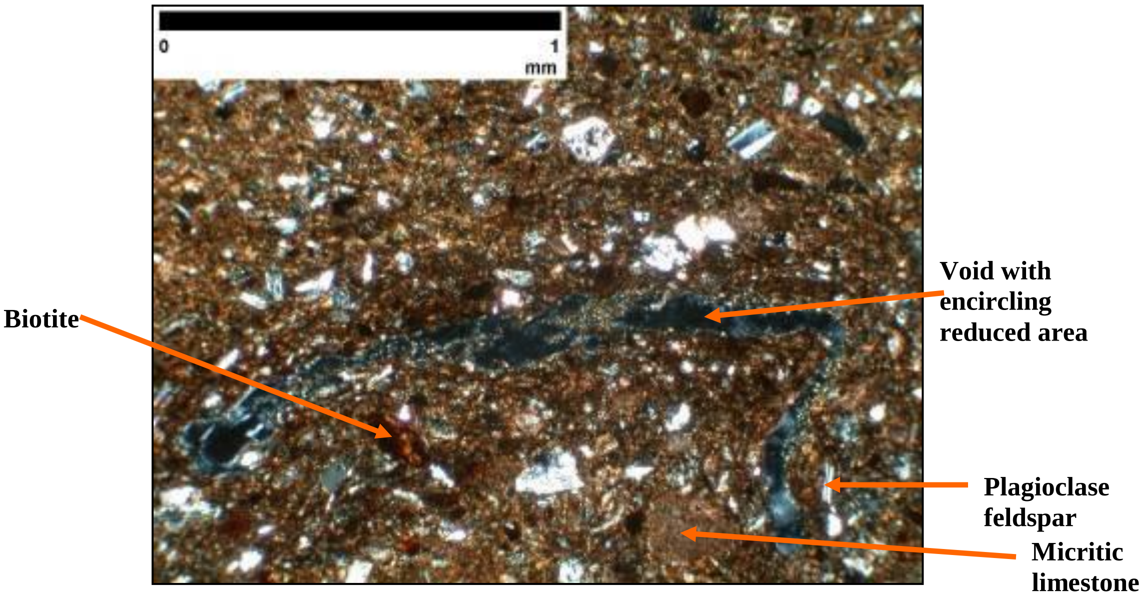


Figure IV.31. RP-1982 is made with fabric IX (XP, full scale: 1mm).

Fabric X is a fine fabric, very homogeneous, distinguished by the frequent presence of small fragments and laths of biotite mica in its composition (**Figures IV.32** and **IV.33**). Other mineral and rock fragments found in fabric X include monocrystalline and polycrystalline quartz, micritic limestone and pyroxenes. Even though the minerals and rocks recorded in the composition of fabric X are also met in the composition of fabric IX, nonetheless the absence of voids and reduced areas, and the more frequent presence of biotite mica within the clay matrices of samples forming fabric X, indicate that this is a technologically and mineralogically distinct fabric. The small size of inclusions that do not exceed 0.2 mm characterises a fine, well-sorted fabric.

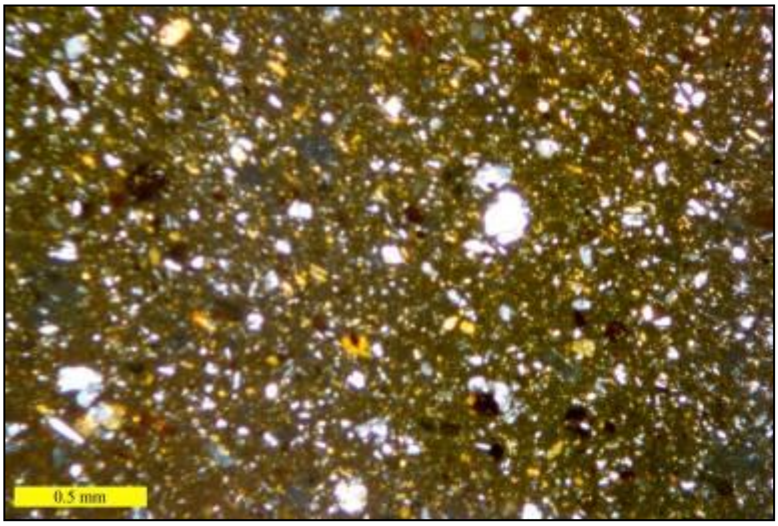


Figure IV.32. RP-7208 is made with fabric X. The orangish mineral inclusions in the sample's clay matrix are small fragments and laths of biotite mica (XP, full scale: 0.5mm).

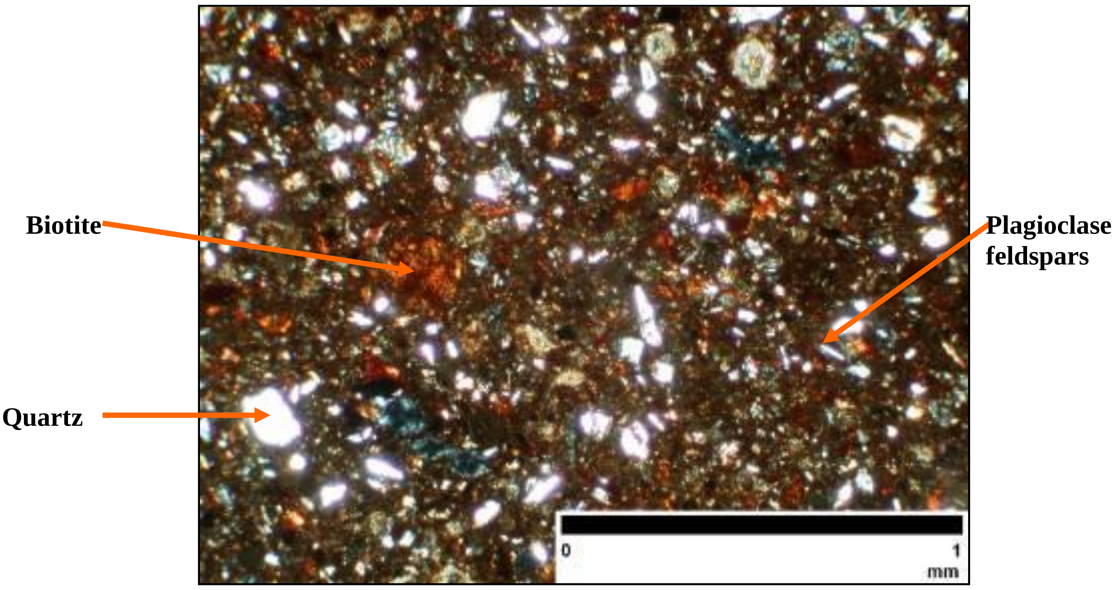


Figure IV.33. RP-6365 is made with fabric X. The orangish brown mineral inclusions are fragments and laths of biotite mica. Also visible are monocrystalline quartz and plagioclase feldspars (XP, full scale: 1 mm).

Fabric XI is the only fabric distinguished by the dominant presence of dolerites in its composition (**Figure IV.34**). Dolerite is restricted to a few fragments in all the other recorded fabrics. Fabric XI is a reddish brown, fine fabric with a strong igneous character. In addition to dolerite rock fragments, monocrystalline quartz is a dominant mineral inclusion in fabric XI (**Figure IV.35**). Plagioclase feldspars are also recorded and more rarely some fragments of basalts, biotite and pyroxene. Some of the quartz fragments indicate evidence of metamorphism. Despite their abundance, inclusions follow the same size, distributed evenly across the samples' clay matrices.

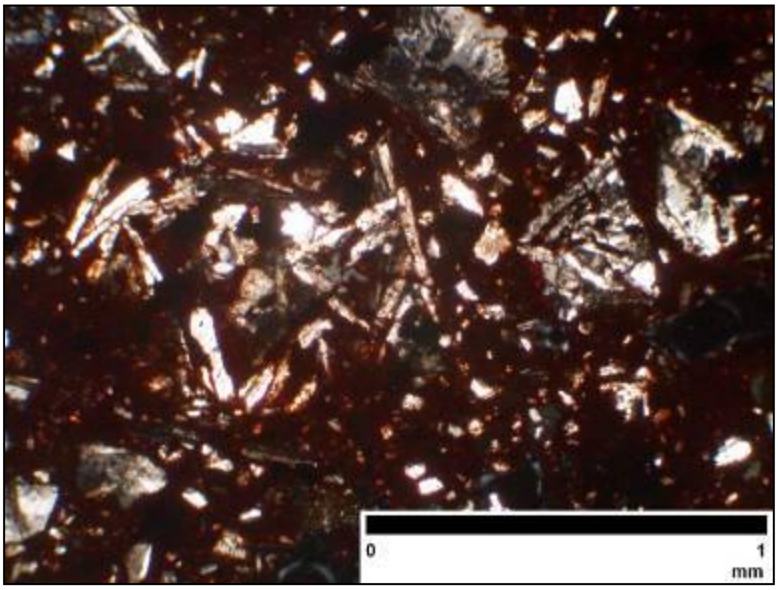


Figure IV.34. A fragment of dolerite in RP-9242, a sample made with fabric XI (XP, full scale: 1mm).

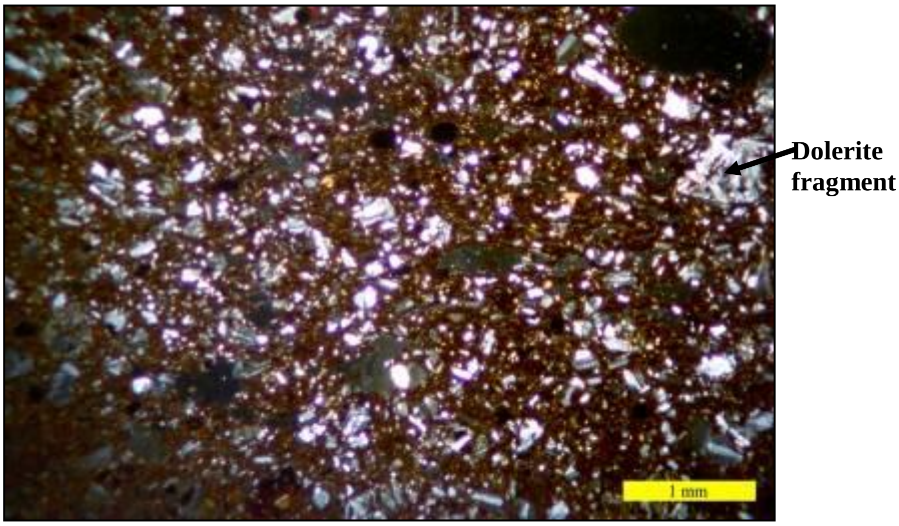


Figure IV.35. RP-14377 is made with fabric XI. This is a fabric rich in monocrystalline quartz (white sub-angular and sub-rounded inclusions. Some plagioclase feldspar laths are also visible in white (XP, full scale: 1mm).

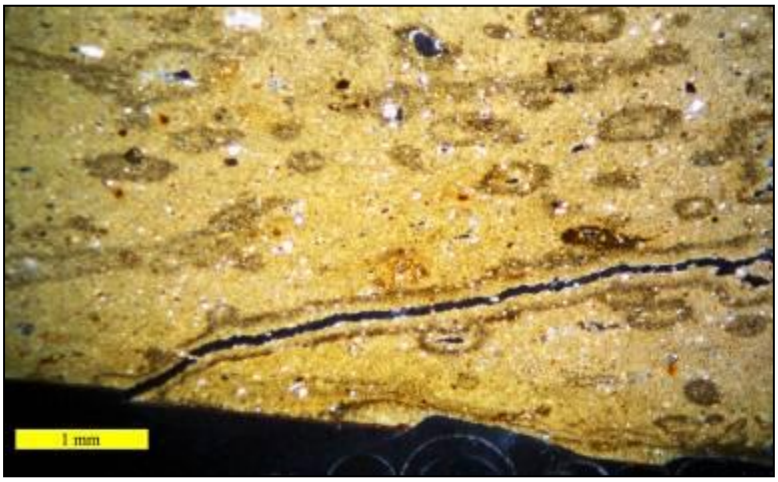


Figure IV.36. RP-3609 is made with fine fabric XII (XP, full scale: 1mm).

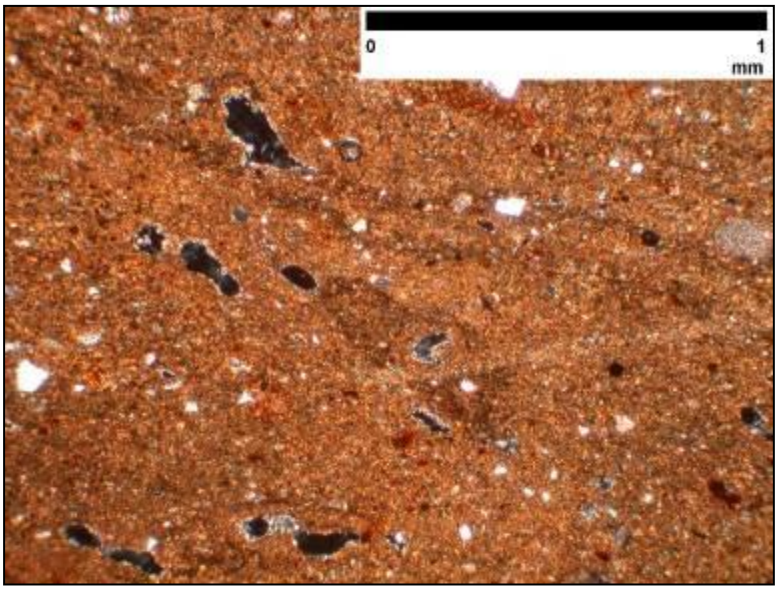


Figure IV.37. RP-7256 is made with fine fabric XII (XP, full scale: 1mm).

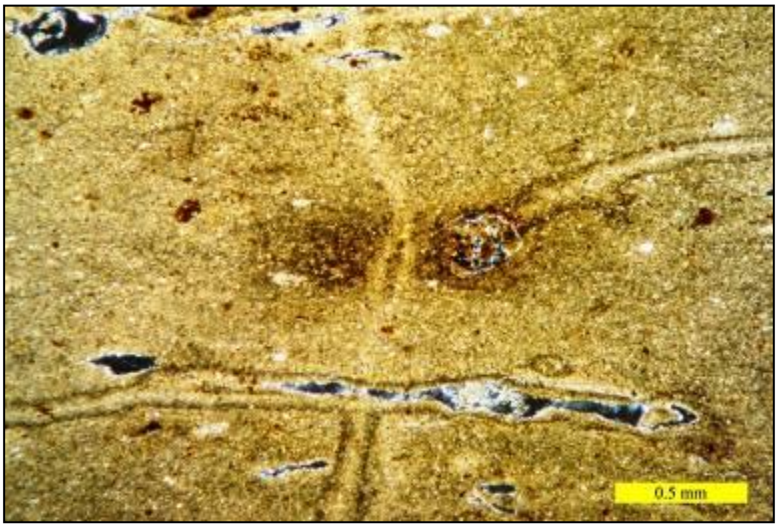


Figure IV.38. RP-14053 is made with fine fabric XII (XP, full scale: 0.5 mm).

Fabric XII is one of the finest fabrics recorded. It is characterised by a restricted presence of aplastic inclusions (**Figures IV.36, IV.37** and **IV.38**), which, when found, are very small in size, and double- to open-spaced. These infrequent inclusions include calcite, micritic limestone, and monocrystalline and polycrystalline quartz. In fine fraction some biotite and muscovite mica laths were also identified. The samples composing fabric XII are distinguished for the softness of their pastes (hardness ranges from 1 to 2 on Moh's scale). The samples are made with light-coloured clay and seem to be well-oxidised as there is no colour variation between the cores and margins of the vessels (**Figures IV.36, IV.37** and **IV.38**). There are a few long planar voids, like thin hair cracks, traversing the clay matrices of most of the samples made with fabric XII (**Figures IV.36, IV.37** and **IV.38**). Finally, small voids distributed across the sections of these samples indicate the presence of organic temper, which was burnt during firing.

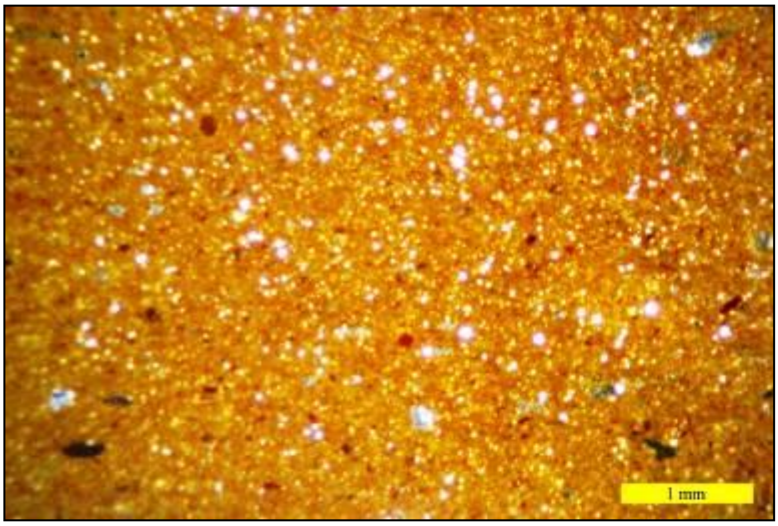
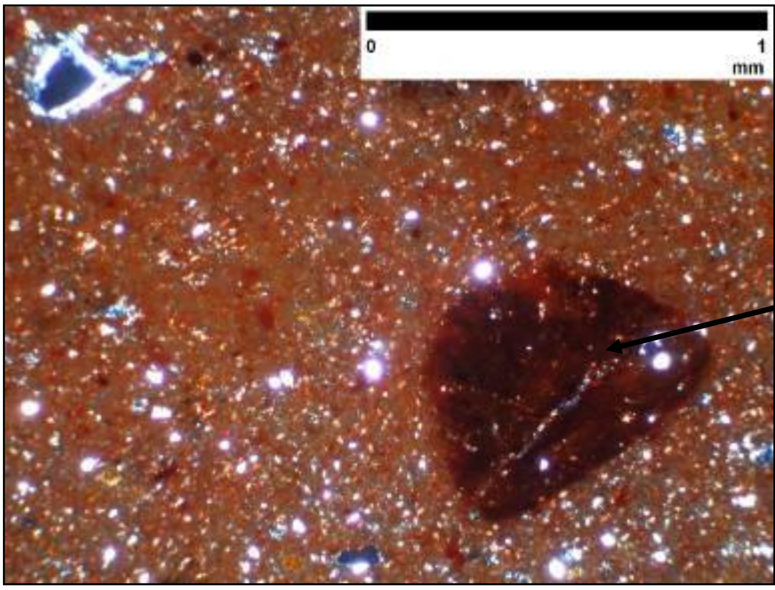


Figure IV.39. ERS-15739 is made with fabric XIII. (XP, full scale: 1 mm).



A large tcf

Figure IV.40. ERS-11482 is made with fabric XIII (XP, full scale: 1 mm).

Fabric XIII is the finest fabric recorded. Fabric XIII is a very homogeneous fabric without any visible colour variations between the cores and the margins of the vessels. When present, the small-sized inclusions in this fabric are monocrystalline and polycrystalline quartz, micritic limestone, sandstone, and some biotite mica in fine fraction (**Figures IV.39** and **IV.40**). The most prominent features of this fabric are the acfs, which vary in colour from dark reddish brown to reddish orange and are sub-rounded and rounded from high to low sphericity, and some tcfs which vary from high to medium sphericity and in many cases contain monocrystalline quartz and biotite (**Figures IV.40** and **IV.41**).

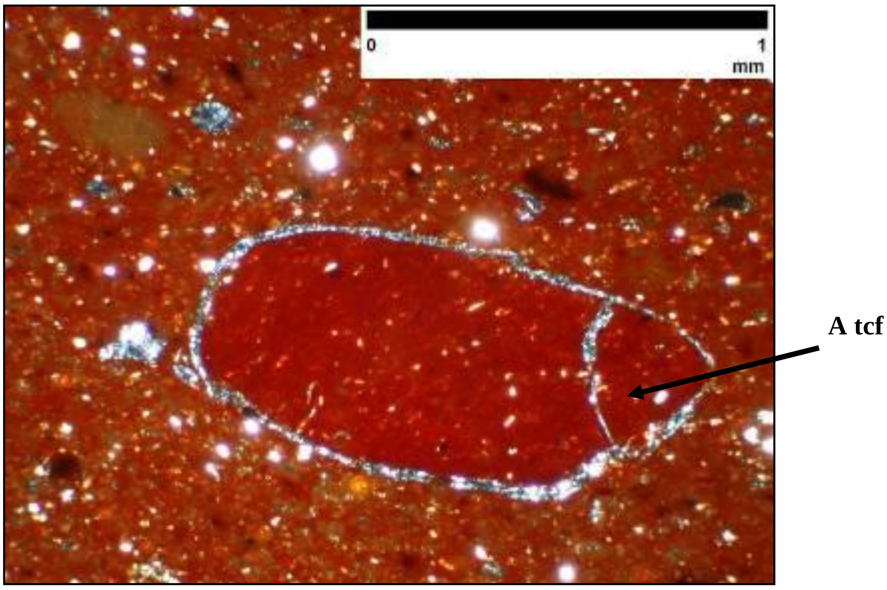


Figure IV.41. A tcf in ERS-16534, made with fabric XIII (XP, full scale: 1 mm).

Figure III.42 a-c. PRS MA-14338 (**a**), PRS MA-16466 (**b**) and PRS MA-16549 (**c**) have all blackened internal structures. These specimens were fired in reduced atmospheres.

Finally, three samples, PRS MA-14338, PRS MA-16466 and PRS MA-16549 were clustered together due to their "reduced-fired" appearance. Even though there are not any traces on any of these specimens' external surfaces to indicate internal blackened walls (**Figure IV.42 a-c**), the corresponding thin sections were blackened and thus it was difficult to describe their mineralogy. Those few inclusions that could be identified include basalts and dolerites, and more rarely carbonates (**Figures IV.43** and **III.44**). Evidently, there are no strong arguments to justify why these samples should form one fabric, as their fabric composition cannot be adequately described due to their reduced nature. It should hence be clarified that these samples are not considered as members of a common fabric cluster, but rather as three specimens sharing a common technique of firing in reduced atmospheres, which has resulted in their blackened appearance.

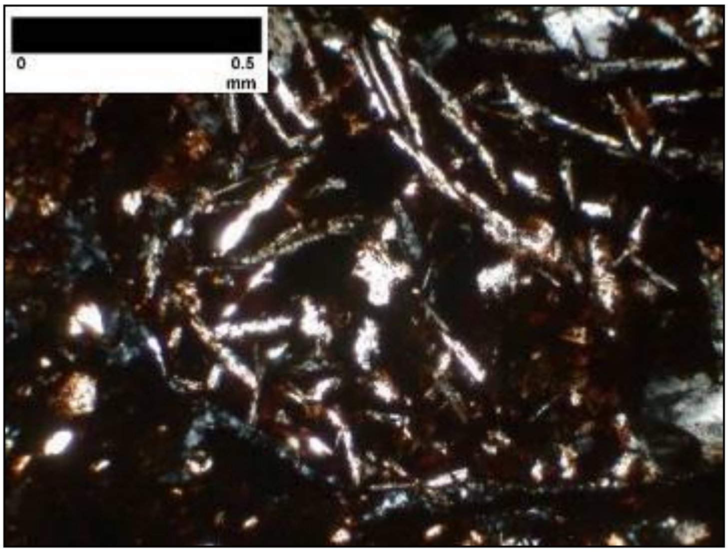


Figure III.43. A large fragment of dolerite in a reduced-fired clay matrix. PRS MA-16549 belongs to the group of reduced-fired specimens (XP, full scale: 0.5mm).

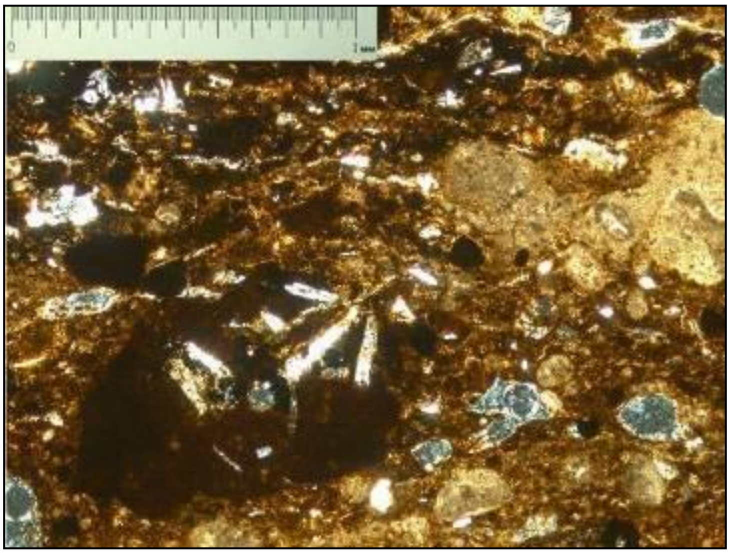


Figure III.44. A fragment of dolerite and several micritic limestone fragments characterise the composition of PRS MA-16466. These are among the restricted number of inclusions recognised in the otherwise reduced-fired specimen (XP, full scale: 0.5mm).

In addition to the 13 defined fabrics, 21 samples (**Table IV.4**) representing 11% of the entire Marki sample, were not allocated to any of these fabrics, contributing to the fabric variability within the Marki sample. All the outlier samples are made with fine fabrics, in most cases without any discriminating petrology and no mineralogical associations among them or with any of the recorded fabrics. Therefore, it is very difficult to infer whether these vessels are locally made at Marki or if they were imported from elsewhere. In view of the current data, any such suggestions can be based solely on the typological and stylistic attributes of the outlier vessels.

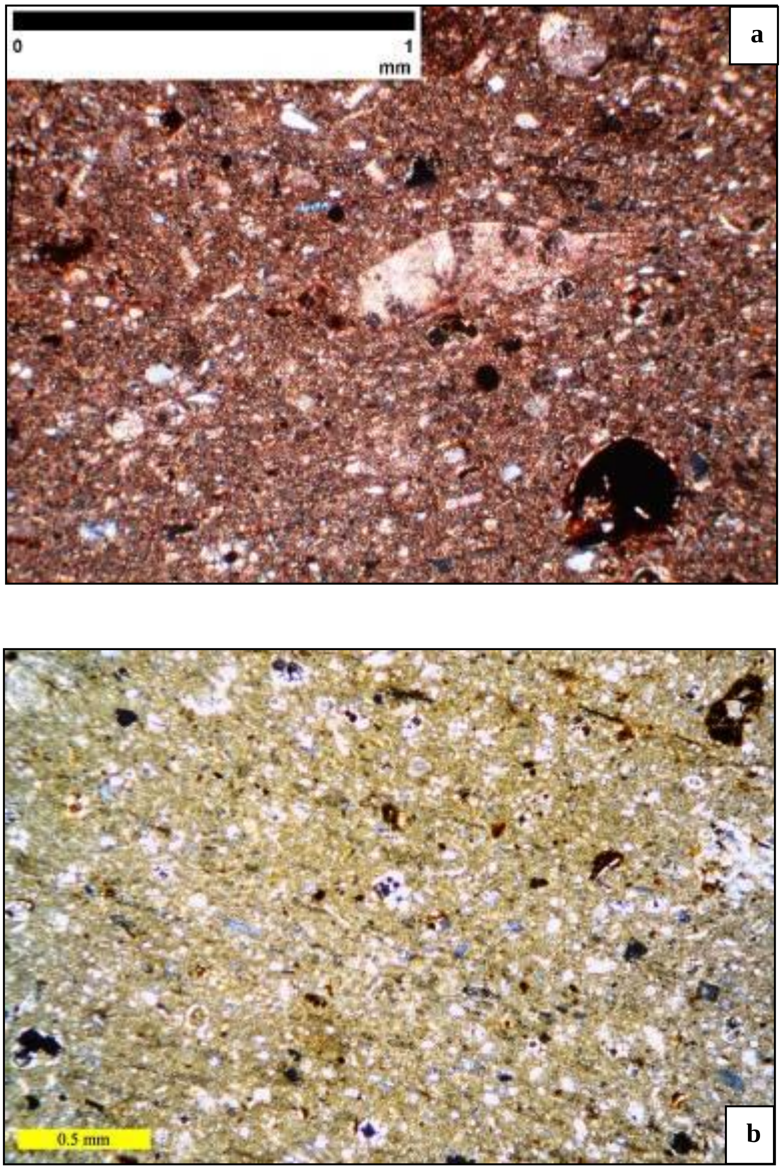


Figure IV.45.a-b. The mineralogical characteristics of RP-14957 (both **a** and **b**) are associated with Deneia fabric A (Dikomitou 2007) (XP, full scales: 1mm and 0.5 mm).

Finally it should be noted that the fabric with which outlier sample RP-14957, a black-topped small bowl, is made, looks identical to one of the fabrics argued to be locally produced at Deneia. The micritic clay, microfossil species, laths of muscovite mica in RP-14957 (**Figure IV.45.a-b** – for comparison with Dikomitou 2007, 114, Text Figures 5.8 and 5.9), the inclusions' overall density and distribution and colour of the fabric strongly resemble fabric A from Deneia (Dikomitou 2007).

Overall, from a mineralogical point of view, the Marki sample is dominated by fabrics rich in igneous materials, forming the basis of the four coarse fabrics from Marki, coexisting in fabrics II, III and VI with sedimentary materials. Igneous materials are also present in the finer fabrics. The presence of igneous materials in eight of the recorded fabrics (fabrics II, III, IV, VI, VII, VIII, IX, X, XI) in the form of basalts, dolerites, biotite mica, pyroxenes, and plagioclase feldspars indicate that the raw materials for the production of these fabrics were selected from areas around the circumference of the Troodos mountain range (Constantinou 2002; Gass 1960). Fabrics I and V are technologically and mineralogically very different from all other fabrics, characterised by the presence of tempering material and chert fragments. Fabrics XII and XIII are the finest fabrics from EC-MC Marki, with very few inclusions and hardly any discriminating petrology.

These 13 ceramic fabrics, either local or imported, represent the principal ceramics in use at Marki for more than five hundred years. The number of fabrics is analogous to the long lifespan of the settlement, but it is also indicative of technological changes recorded with the passage of time in ceramic production. As the raw materials for the majority of these fabrics derive from the central, igneous geological zone encircling the Troodos Mountains, where Marki is also located, it is argued that most of these fabrics were either locally produced at Marki or distributed from elsewhere within the central-south region. The typologies and styles included in each fabric were especially useful in determining, if not for all defined fabrics, at least for many of them their local or imported nature (section IV.3).

IV.2.b. The chemical data.

From the 185 samples from Marki selected for this second case study, ED-XRF analysis was employed for the chemical characterisation of 133 (including the 36 RPP samples from Marki already analysed with ED-XRF for the purposes of the first case study – Chapter III). The samples were analysed following the standard procedures described in Chapter II. Moreover, SEM-EDS analysis was also used for the chemical characterisation of the clay matrices and individual inclusions, and for addressing particular questions related to the chemical composition of individual samples, and the fabrics defined by petrographic analysis. The samples selected for ED-XRF analysis represent all the different ceramic types and styles included in the Marki sample (**Figure IV.46**), as well as all the settlement's phases of occupation.

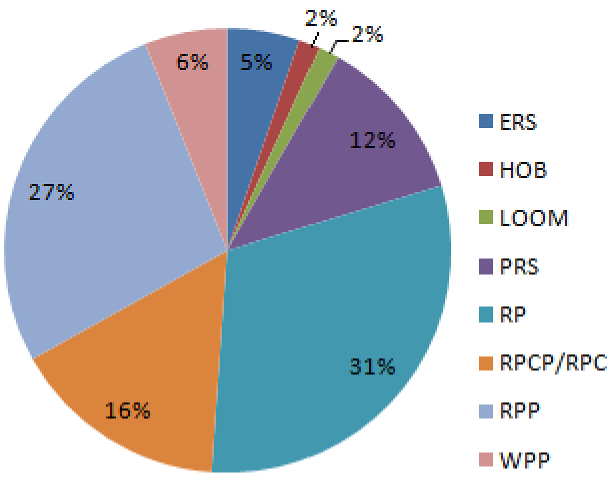


Figure IV.46. % of ceramic wares in the sample analysed with ED-XRF.

Comparing the mineralogical and chemical datasets (**Appendices IV.3** and **IV.4**), the degree of correspondence between the respective mineralogical and chemical clusters was evaluated, in order to assess their validity and determine the degree of confidence in these groupings. The two methods of chemical analysis, namely ED-XRF and SEM-EDS, were used as complementary to petrography, in order to understand better inter- and intra-fabric variability, as well as the samples' and the respective fabrics' compositional characteristics (**Appendix IV.4.a** and **IV.4.b**).

In **Appendix IV.4.a** the lowest analytical total values relate to the most calcareous samples, whereas the samples with the highest analytical totals are the least calcareous specimens in the Marki sample. The low analytical total measurements, especially for the calcareous samples are due to the inability of ED-XRF to measure carbon (C). Carbon is mostly present in organic matter and calcium carbonates, which, as petrographic analyses have already shown, are both frequently found in ceramic matrices, in the form of voids (organic matter burnt during firing), limestones and microfossils. Carbon from both calcareous and non-calcareous ceramics was measured in an earlier study of MC pottery (Dikomitou 2007) using a chemical method of carbon-sulphur determination. This method of analysis has verified that the highest percentages of carbon in the samples are always associated with the highest concentrations of calcium oxide, and *vice versa* the lowest percentages of carbon in the samples are always related with the lowest concentrations of calcium oxide (Dikomitou 2007, Table 5.6).

It is almost impossible to find two ceramic samples with identical compositional characteristics. The nature of the ceramic material implies that some variation exists even among vessels made with the exact same fabric. However, any compositional differentiation between vessels made with the same materials should be restricted and comparatively much lower than that between specimens made with different fabrics. In order to evaluate the chemical variation within each mineralogical grouping and define the degree of confidence in the analysed dataset, s and CV, the most commonly used measures of variability, were calculated.

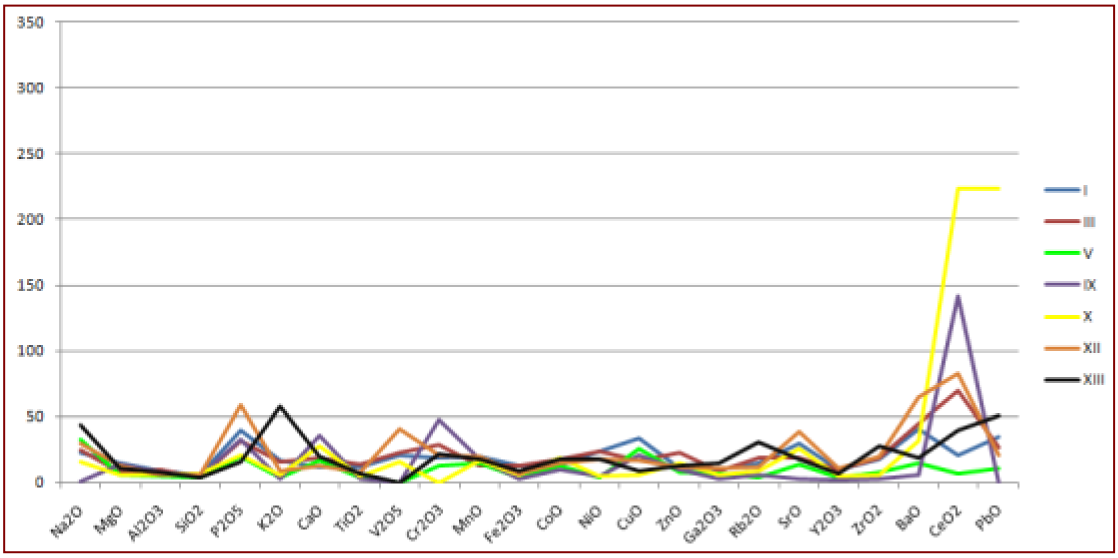


Figure IV.47. Coefficient of variation (CV, in %) values for each compound in the composition of fabrics I, III, V, IX, X, XII and XIII.

The coefficient of variation (CV) for each compound in the composition of each fabric was evaluated as a standardised measure of dispersion (Shennan 1997, 44). Looking at the fluctuation of the CV values for each compound in the composition of the fabrics **(Figures IV.47** and **IV.48**), some fabrics are characterised by greater chemical dispersion **(Figure IV.48**) than others **(Figure IV.47**). Comparing the overall CV values for all compounds and all fabrics, it is argued that fabrics I, III, V, IX, X, XII and XIII present the shortest typical distances from the average (mean, μ) values, which means that these fabrics are chemically more homogeneous in their groupings and present lower internal compositional variability than the other fabrics (**Appendix IV.4.b** and **Figure IV.47**).

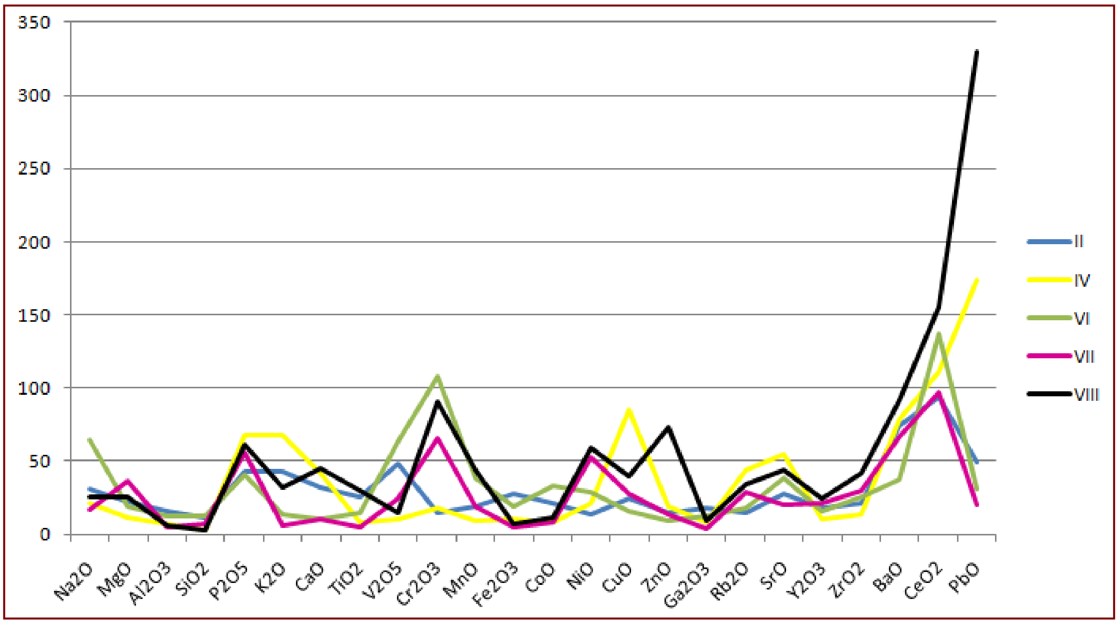


Figure IV.48. Coefficient of variation (CV, in %) values for each compound in the composition of fabrics II, IV, VI, VII and VIII.

On the other hand, CV values for fabrics II, IV, VI, VII and VIII are more dispersed (**Appendix IV.4.b** and **Figure IV.48**), indicating that these fabrics are chemically more heterogeneous than the aforementioned fabrics. CV values are generally more dispersed for barium, cerium and lead oxides for all fabrics. The overall fluctuation in the CV values and the degree of chemical homogeneity characterising each fabric is affected by the original compositional homogeneity of the raw materials, but also by the techniques subsequently used for the processing of raw materials and fabric preparation.

PCA was used for the statistical manipulation of the ED-XRF dataset in order to detect any possible structures in the chemical relationships among the samples. **Figure IV.49** shows the element compounds used as variables in PCA analysis. From the 21 variables used (**Figure IV.49**), a reduced set of four components was extracted. However, only the two most important principal components (PCs) were used, PC1 and PC2, which summarise 57% of the total variance. The reason for this is that the variance in these two components exceeds by far the variance of the remaining components. It should also be stated that no interesting patterns were observed when examining the third and fourth components.

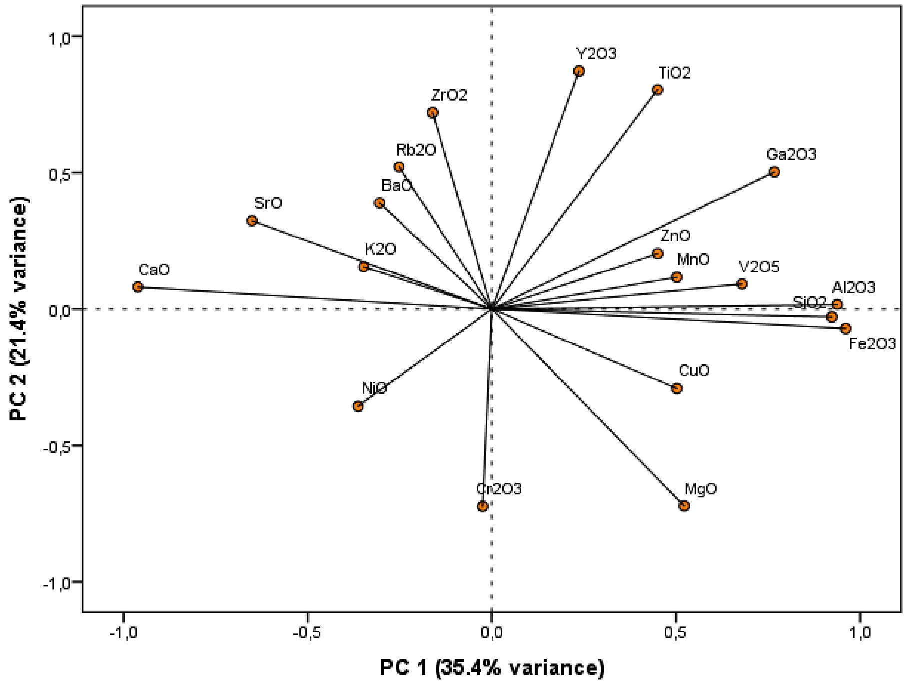


Figure IV.49. The PCA component plot based on the ED-XRF dataset.

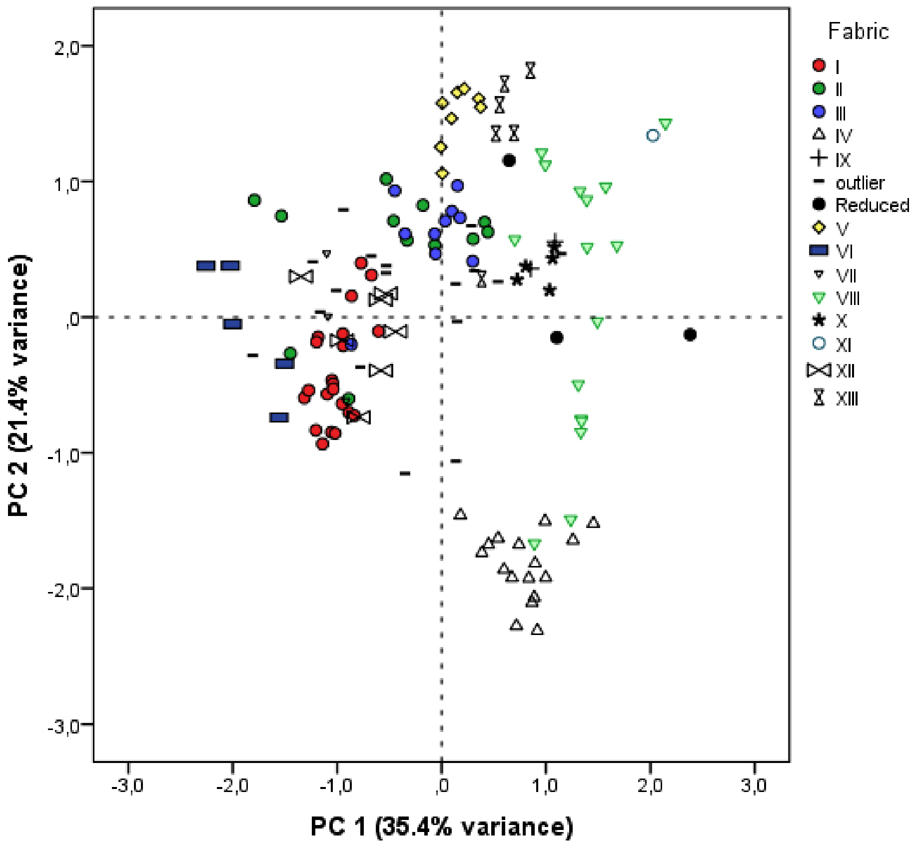


Figure IV.50. PCA scatterplot based on the ED-XRF dataset. Samples are marked according to the fabric to which they were allocated by petrography.

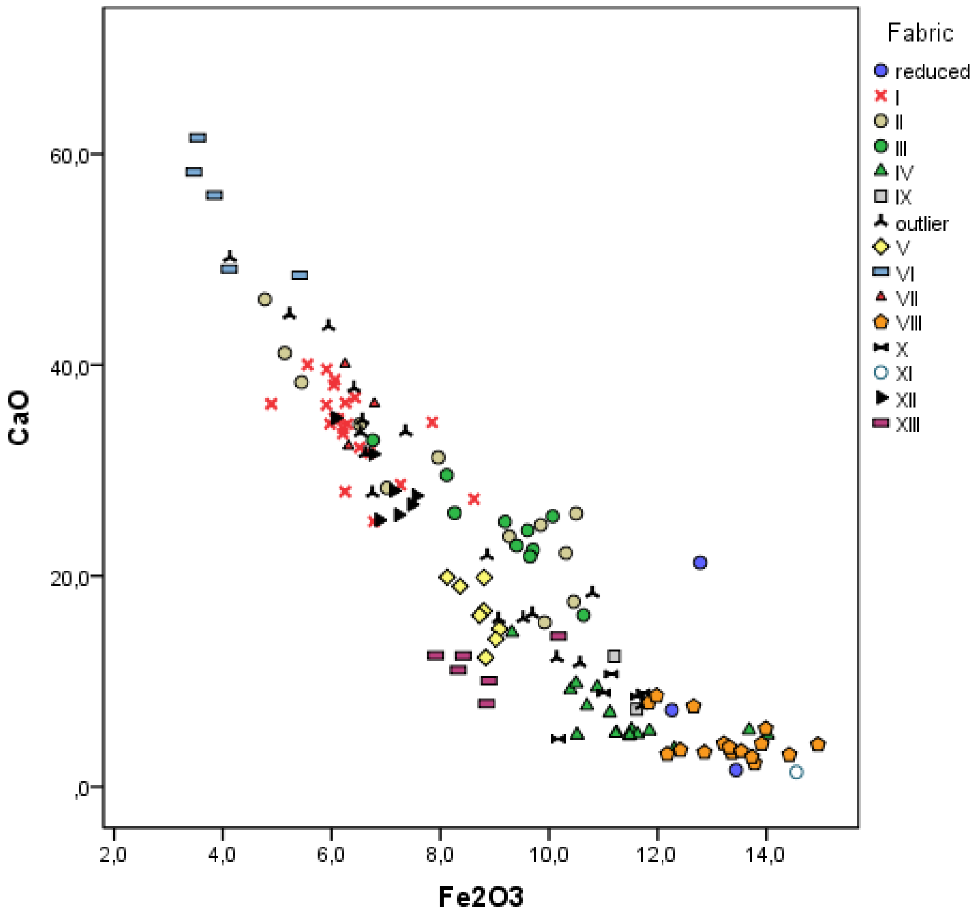


Figure IV.51. Bivariate scatterplot showing the concentrations of calcium (CaO) and iron (Fe_2O_3) oxides, as defined by ED-XRF analysis, in the composition of the Marki samples. Samples are marked according to the fabric to which they were allocated by petrography.

The varying degree of correspondence between the mineralogical and chemical groupings can also be observed in **Figure IV.50**. It can be argued that the samples allocated by petrography to each of the 13 fabrics present similar concentrations in calcium and iron oxides within their groupings (**Figure IV.51**), but on the whole their chemical characteristics are not always matching (**Figure IV.50**). **Figures IV.50** and **IV.51** strengthen the argument that some mineralogical groupings, namely fabrics I, III, V and XIII are chemically more uniform than the remaining fabrics, which are represented by more loose chemical clusters.

A major element, of which the concentration in the samples' composition is noteworthy, is calcium. As has been shown in the preceding chapter, calcium can be incorporated in the samples' chemical composition for a number of reasons. Minerals from the calcium family occur most commonly in various forms of calcium carbonate ($CaCO_3$), a substance frequently found in rocks, such as limestone, and it is also the main component in microfossil shells (Rothery 2003, 130; Rice 1987, 97). Calcium carbonate is also very commonly found as the mineral calcite in clays (Rothery 2003, 130; Rice 1987, 97). Lime or calcium can also occur naturally in clays, which are then characterised as calcareous (Rice 1987, 97).

The distinction between calcareous and non-calcareous clays is a basic first stage for assessing the selection and use of raw materials for pottery production and fabric variability among different functional groups. Calcium is one of the major elements affecting the physical properties of clays when present in their composition. Calcareous clays tend to be more plastic and soft on the hardness scale, and require some caution during firing, especially if fired above 650-750ºC. This is due to a very distinctive property of calcium carbonate; it decomposes during firing at temperatures as low as 650-750ºC (Rice 1987, 98).

As Rice argues, the temperature at which calcite decomposition takes place is a matter of debate and it is closely linked with the atmosphere and duration of firing, in addition to temperature (Rice 1987, 98). In any case, during decomposition or decarbonisation, calcium dioxide is removed in the form of gas and lime is produced (Rice 1987, 98; Shoval *et al.* 1993). The problem for the fired vessels occurs during cooling, when lime starts absorbing moisture from the atmosphere, producing quick lime and releasing heat. All these procedures lead to the creation of stresses in the ceramic body, which can ultimately cause cracking and lime popping or spalling, and as the rehydration of the lime reduces the strength levels of pottery, in extreme cases lime rehydration can lead to pottery collapse (Rice 1987, 98). This is the main reasons why calcareous clays are not commonly used for the production of cooking pots, where continuous use over fire implies repeated heating and cooling sessions.

In the Marki sample, there is an overall preference for non-calcareous clays or clays with minimum concentrations of calcium in their composition. **Table IV.5** shows how calcium oxide varies in the composition of each individual fabric. It seems that only 11 out of the 73 samples (15% of the whole sample) are characterised by high calcium oxide concentrations, which exceed 30 per cent of the samples' overall compositions. On the other hand 37% of the analysed samples are made with fabrics which vary between 10% and 30% in calcium oxide, while almost half of the entire Marki sample is made with fabrics with very low calcium oxide concentrations, which do not exceed 10% of their total chemical composition.

As observed in **Table IV.5,** fabric VI is the most calcareous fabric. Within fabric VI, LOOM-13585 is the most calcareous specimen as the concentration of calcium oxide in its composition exceeds 60%. Similarly, the concentration of calcium oxide in the elemental compositions of HOB-13262 and LOOM-13829 varies between 56% and 58%. From a mineralogical point of view, the high concentration of calcium oxide in the composition of the samples made with fabric VI is explained by the predominant presence of micritic limestone, the dominant presence of calcite mineral and the frequent presence of microfossils in addition to lime naturally occurring in the clay (**Figures IV.11-IV.13** and **IV.15**).

		CaO (%)								
		0-10	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	no. sample	% sample
Marki fabrics and outliers	**I**			4	16	1			21	16
	II		2	5	3	2			12	9
	III		1	8	1				10	8
	IV	16	1						17	13
	V		8						8	6
	VI					2	2	1	5	4
	VII				2	1			3	2
	VIII	16							16	12
	IX	1	1						2	2
	X	4	1						5	4
	XI	1							1	1
	XII			5	2				7	5
	XIII	1	5						6	5
	Reduced	2		1					3	2
	Outliers	1	6	2	5	2	1		17	13
	no. sample	42	25	25	29	8	3	1	133	
	% sample	32	19	19	22	6	2	1		

Table IV.5. The concentration of CaO (%) in the composition of the Marki ceramic fabrics.

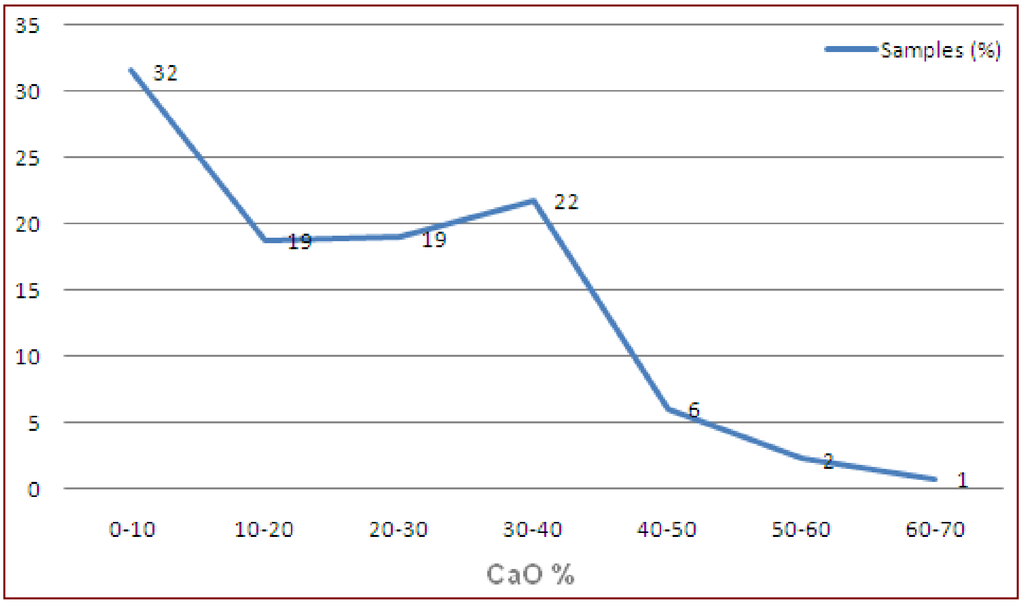


Figure IV.52. The variation of CaO (%) in the composition of the Marki ceramic fabrics.

Figure IV.52 shows the overall presence of calcium oxide in the Marki sample as measured by ED-XRF. As shown in the graph, 32% of the Marki samples are made with fabrics with minimum presence of calcium oxide in their composition. However, the majority of the samples are made with calcareous clays (>6% CaO). In the last section of this chapter an investigation is made whether there is any relational pattern among the concentration of calcium in the Marki fabrics, chronology and wares, and/or different vessel shapes and functional groups.

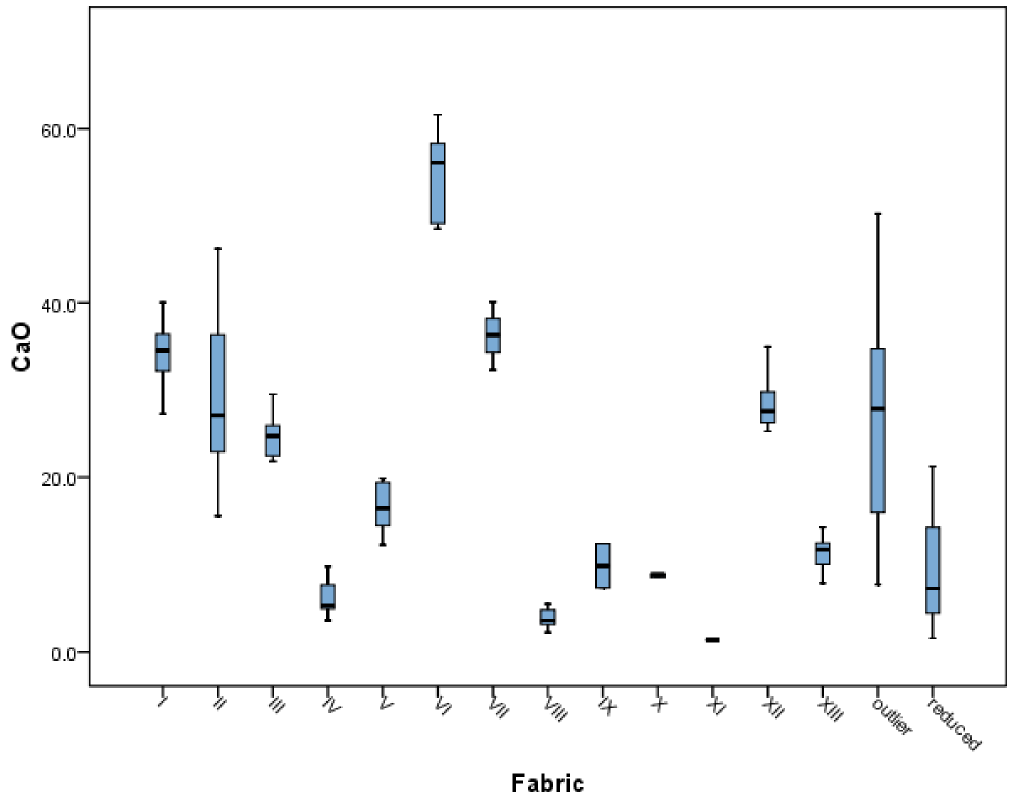


Figure IV.53. The presence of CaO (%) in the composition of the Marki ceramic fabrics.

Figure IV.53 shows the variation in calcium oxide values within each fabric. The presence of calcium or lime occurring in the clay affects significantly the concentration levels of calcium oxide in the samples' elemental composition, perhaps more than the calciferous inclusions (**Figures IV.54** and **IV.55**). For example, fabric XII, despite the absence of any type of inclusions within the corresponding samples' clay matrices (**Figures IV.36-IV.38**), presents high calcium oxide values, comparable with the concentration of calcium oxide in fabrics which are characterised by the dominant presence of microfossils and micritic limestone fragments, such as fabrics III and V (**Figure IV.53**). Therefore, the concentration of calcium oxide in the composition of a fabric is affected both by the clay itself (**Figures IV.54** and **IV.55**) and the inclusions (including temper material) incorporated within the clay matrix (**Figures IV.56** and **IV.57**).

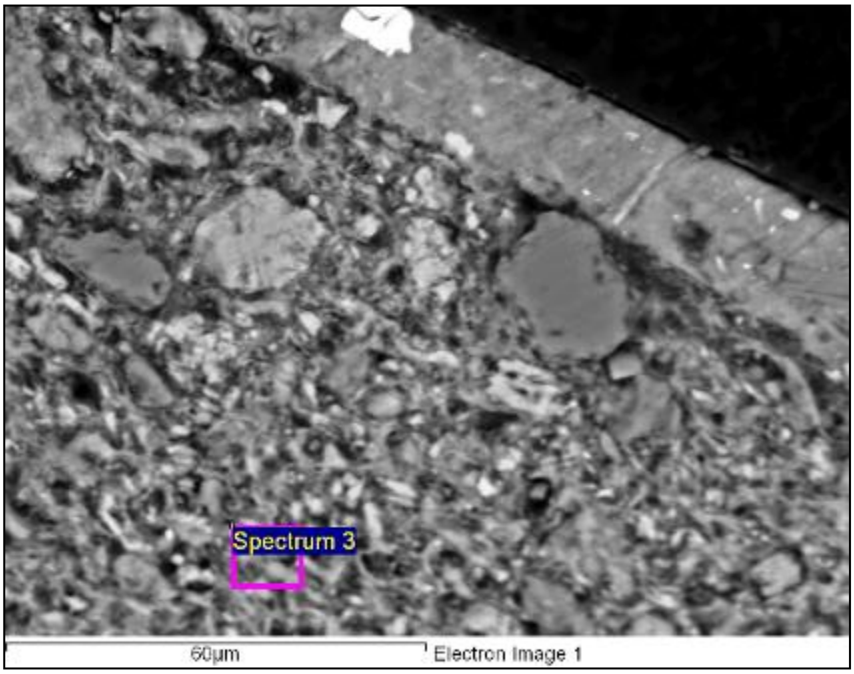


Figure IV.54. Calcium occurs naturally in the clay matrix of RP-4351 made with fine fabric XII. Calcium oxide in the clay composition of this sample ranges around 29%. Other elements identified in its chemical composition by SEM-EDS include Na_2O (0.7%), MgO (2.9%), Al_2O_3 (9.7%), SiO_2 (44.2%), K_2O (2.6%), TiO_2 (1.4%) and FeO (6.8%) (BSE, full scale: 60 µm).

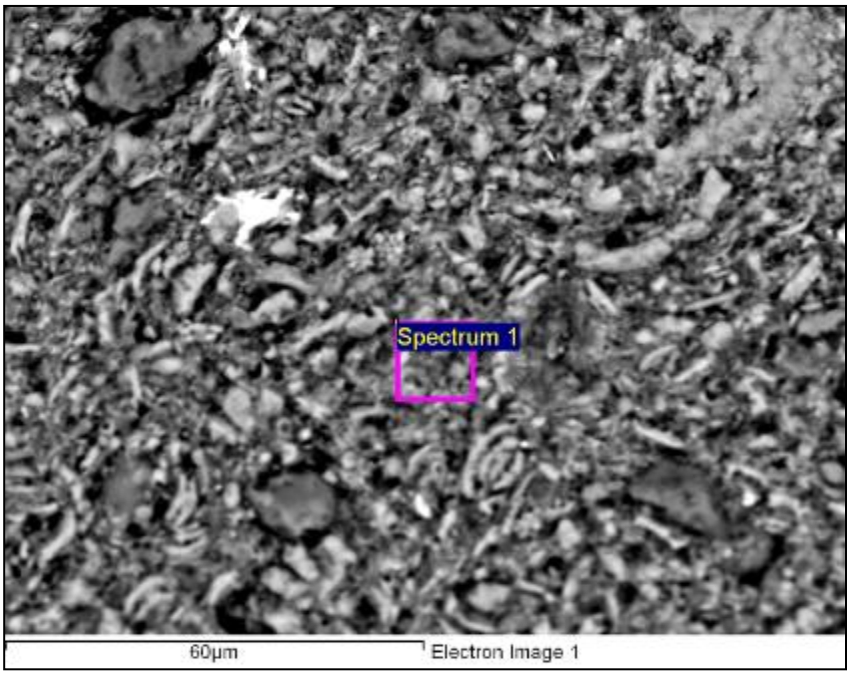


Figure IV.55. Calcium occurs naturally in the clay matrix of RP-4864 made with fine fabric VII. Calcium oxide in the clay composition of this sample ranges around 46%. Other elements identified in its chemical composition by SEM-EDS include Na_2O (0.8%), MgO (2.0%), Al_2O_3 (9.4%), SiO_2 (34.7%), K_2O (1.9%), TiO_2 (0.8%) and FeO (4.6%) (BSE, full scale: 60 µm).

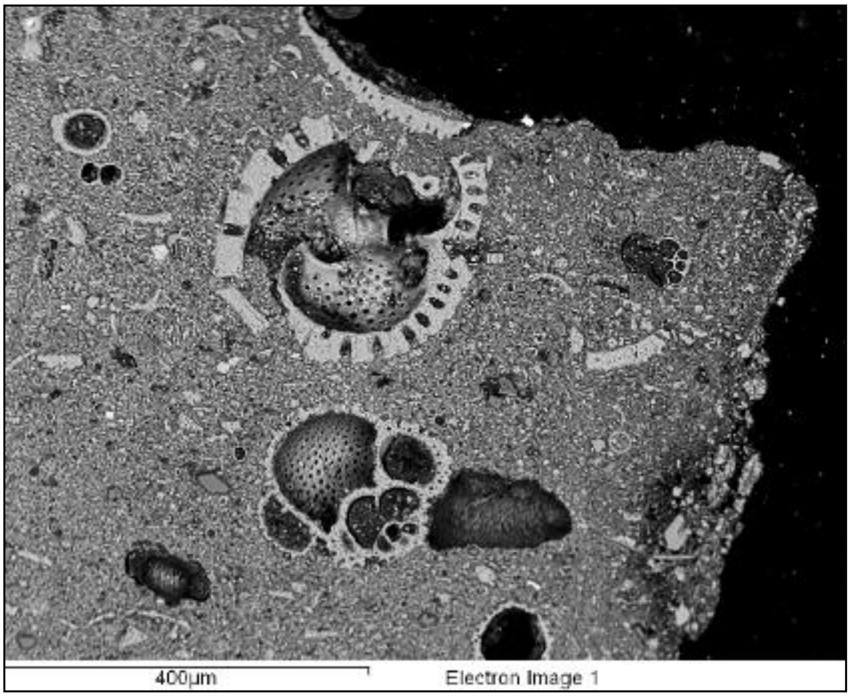


Figure IV.56. RP-4864 is made with fine fabric VII, in the composition of which the largest and most abundant inclusions are microfossils (BSE, scale: 400 μm).

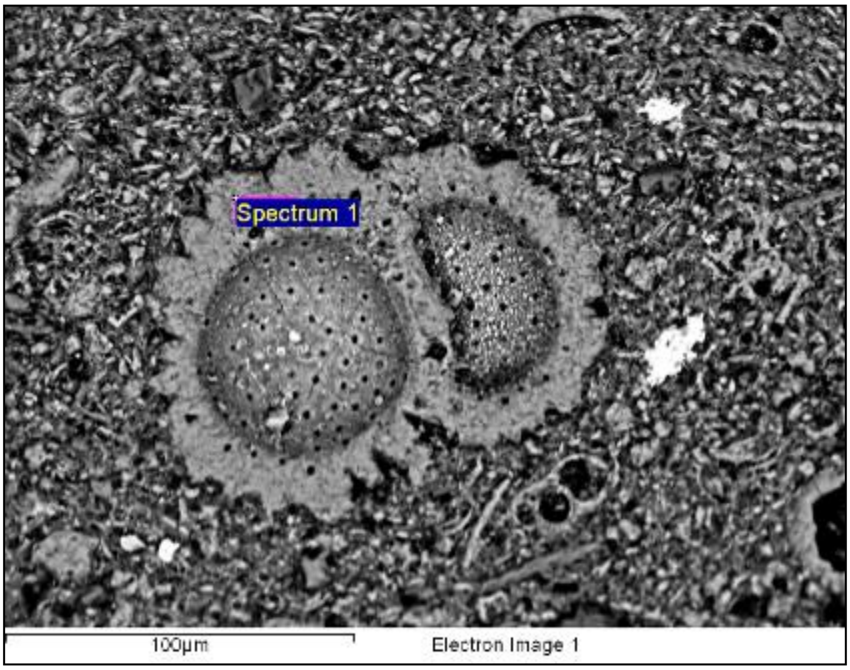


Figure IV.57. Calcium carbonate is the main constituent of microfossil shells. In RP-4864, the chemical composition of these microfossil remnants consists of 99% calcium oxide (CaO) (BSE, scale: 100 μm).

In **Figure IV.53**, the length of the bars indicating the variation of calcium oxide in fabrics II and VI is indicative of the aforementioned chemical inconsistency characterising these two fabrics (note that CaO variation in fabric III, which is very similar to fabrics II and VI, is not that great). This chemical inconsistency can be the result of two main factors: the alluvial character of the fabrics and the presence of diverse material in their composition as a result of natural blending of different constituents. These could both explain why the specimens made with fabrics II and VI do not form tight chemical groupings (**Figures IV.50** and **IV.51**).

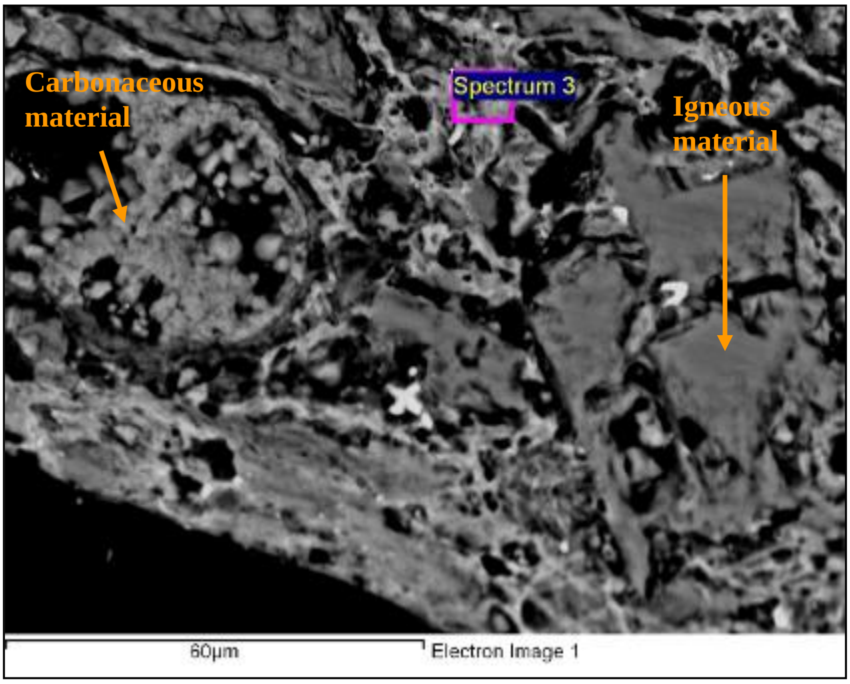


Figure IV.58. The coexistence of carbonaceous and igneous material in the composition of RP-5862, made with fabric II. This fabric, like fabric VI, is characterised by internal variability due to the alluvial nature of these fabrics (BSE, full scale: 60 µm).

Fabric V is another calcareous fabric; a fabric that can be easily distinguished from all the other calcareous fabrics due to the presence in its mineralogical composition of metamorphic inclusions, such as chert and quartzite, and more rarely some muscovite mica laths, as well as due to the even distribution of limestone, the fragments of which follow systematically a size mode around 0.5 mm in long diameter (**Figures IV.9** and **IV.10**). The mineralogical distinctiveness of fabric V is coupled with a chemical consistency; the samples composing fabric V form a perceptible chemical cluster, much tighter than any of the other fabrics (**Figures IV.50** and **IV.51**).

SEM-EDS analyses have shown that the clay used for the production of fabric V is actually non-calcareous, and that the calcium oxide concentration (around 16%) in the overall composition of the fabric is due to the presence of micritic limestone fragments (**Figures IV.59, IV.60** and **IV.61**). The observation that the clay matrix is non-calcareous reinforces the technological argument that this fabric is tempered and that limestone was artificially added during the production of fabric V. In a different scenario, limestone would be expected to occur naturally in calcareous clays.

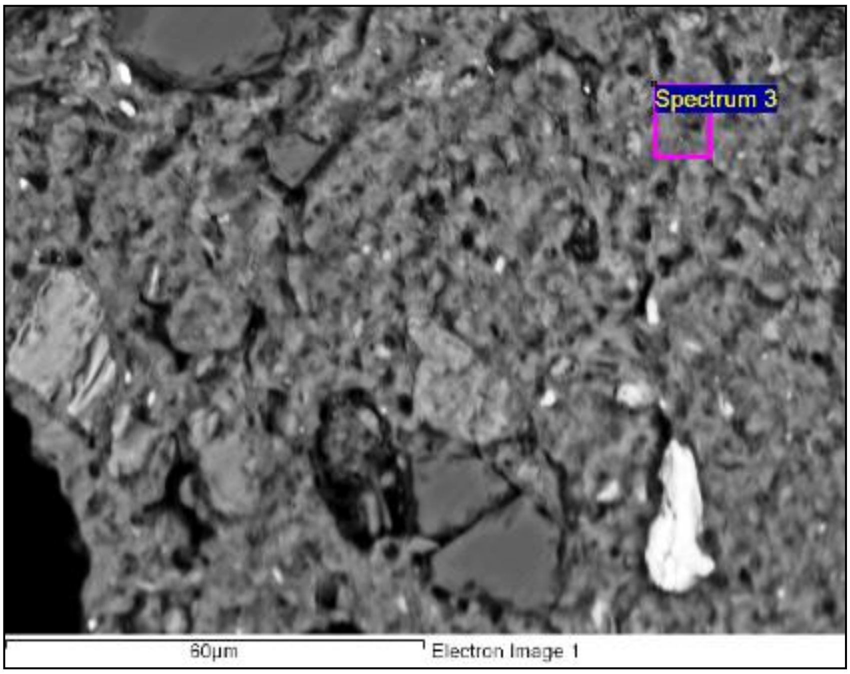


Figure IV.59. SEM-EDS measurements have indicated that the clay used for the production of fabric V is non-calcareous. Calcium oxide in the composition of the clay oscillates around 5%. The chemical composition of the clay in the particular measurement consists of Na_2O (0.3%), MgO (2.4%), Al_2O_3 (16.2%), SiO_2 (59.5%), K_2O (3.5%), CaO (5.2%), TiO_2 (1.0%) and FeO (11.9%) (BSE, full scale: 60 µm).

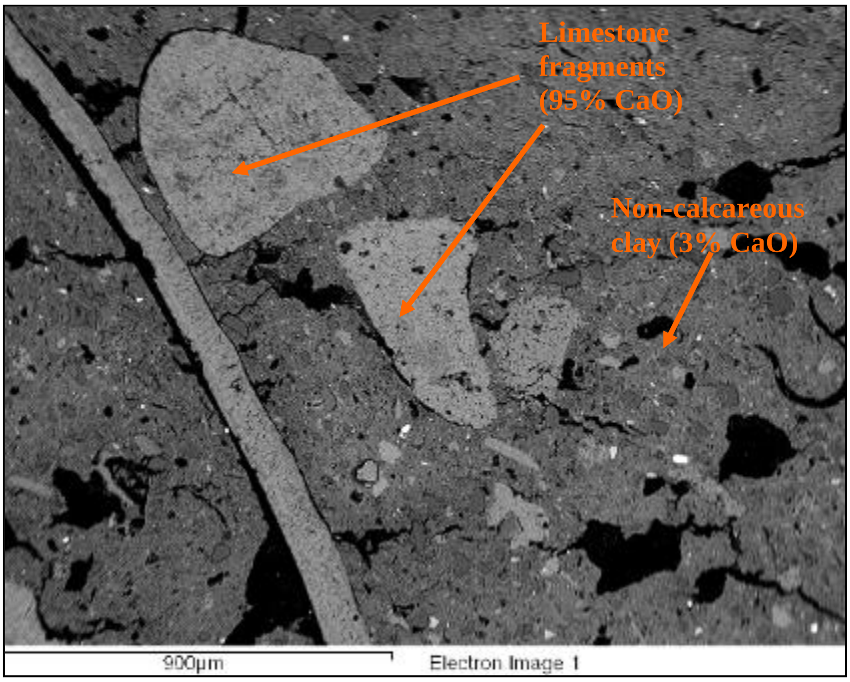


Figure IV.60. RPC-13140 is made with fabric V. SEM-EDS measurements have indicated that the clay used for the production of fabric V is non-calcareous and that it is the presence of micritic limestone that increases the calcium compound in the overall composition of the fabric (BSE, full scale: 900 µm).

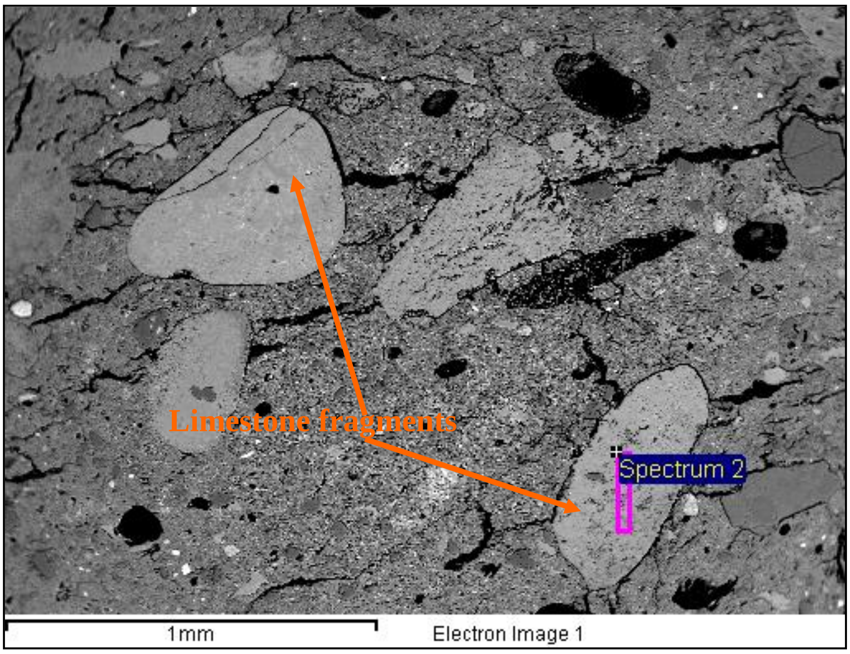


Figure IV.61. RPC-10210 is made with fabric V. This SEM backscattered photomicrograph shows the presence of limestone fragments in the clay matrix of the vessel. The composition of these limestone fragments consists of MgO (1.8%), Al_2O_3 (3.8%), SiO_2 (11.9%), K_2O (0.8%), CaO (79.6%), FeO (1.5%) (BSE, full scale: 1mm).

	Fe_2O_3(%)					
		0-5	**5-10**	**10-15**	no. sample	% sample
Marki fabrics and outliers	**I**	1	20		21	16
	II	1	8	3	12	9
	III		8	2	10	8
	IV		1	16	17	13
	V		8		8	6
	VI	4	1		5	4
	VII		3		3	2
	VIII			16	16	12
	IX			2	2	2
	X			5	5	4
	XI			1	1	1
	XII		7		7	5
	XIII		5	1	6	5
	Reduced			3	3	2
	Outliers	1	12	4	17	13
	no. sample	7	73	53	133	
	% sample	5	55	40		

Table IV.6. The concentration of Fe_2O_3 in the EC-MC fabrics from Marki.

Figures IV.52, IV.53, IV.62 and **Table IV.6** show that the two less calcareous and most ferrous fabrics are fabrics IV and VIII (and the three reduced PRS samples). From a mineralogical point of view, both fabrics are highly igneous with a very restricted presence of any calciferous material, which when found is mainly in the form of random microfossils (**Figure IV.63**).

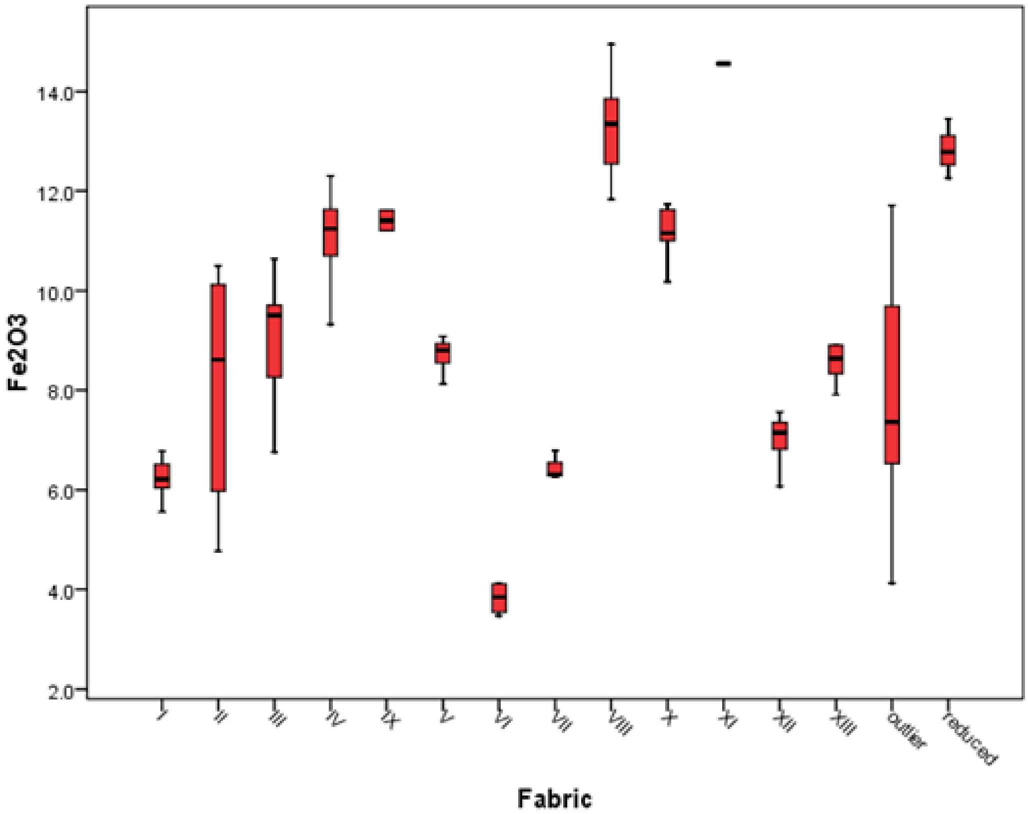


Figure IV.62. The concentration of iron oxide (Fe_2O_3) in the EC-MC fabrics from Marki. This graph is based on **Table IV.6**.

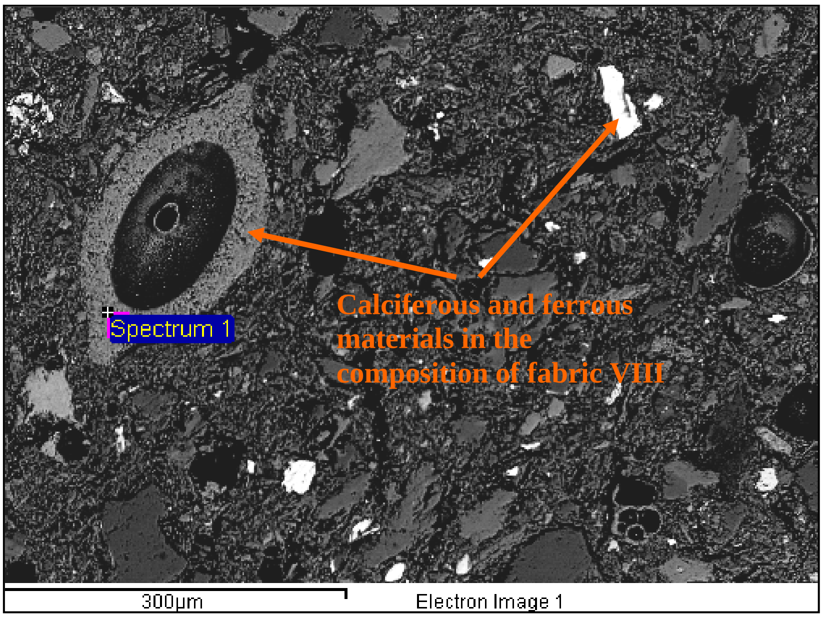


Figure IV.63. The rare presence of microfossils and some ferrous material in RP-5826, made with fabric VIII. The composition of the microfossil shell consists of MgO (2.1%) and CaO (96.5%). The ferrous material's composition consists of MgO (1.5%), Al_2O_3 (5.9%), SiO_2 (12.3%), CaO (0.9%), TiO_2 (1.6%) and FeO (77.8%) (BSE, full scale: 1mm).

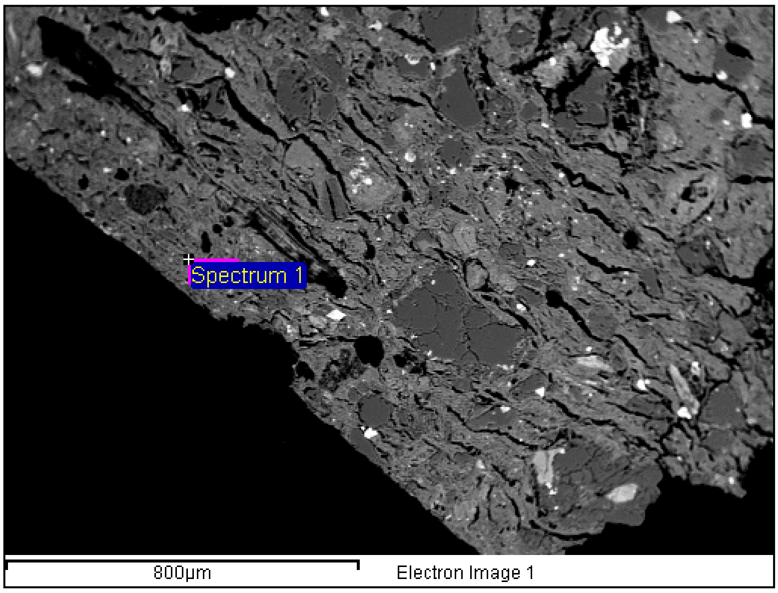


Figure IV.64. RP-9176 is made with fabric VIII. The chemical composition of the clay consists of Na_2O (1.5%), MgO (4.6%), Al_2O_3 (20.1%), SiO_2 (57.5%), K_2O (2.3%), CaO (2.6%), TiO_2 (0.5%) and FeO (11.2%) (BSE, full scale: 800 µm)..

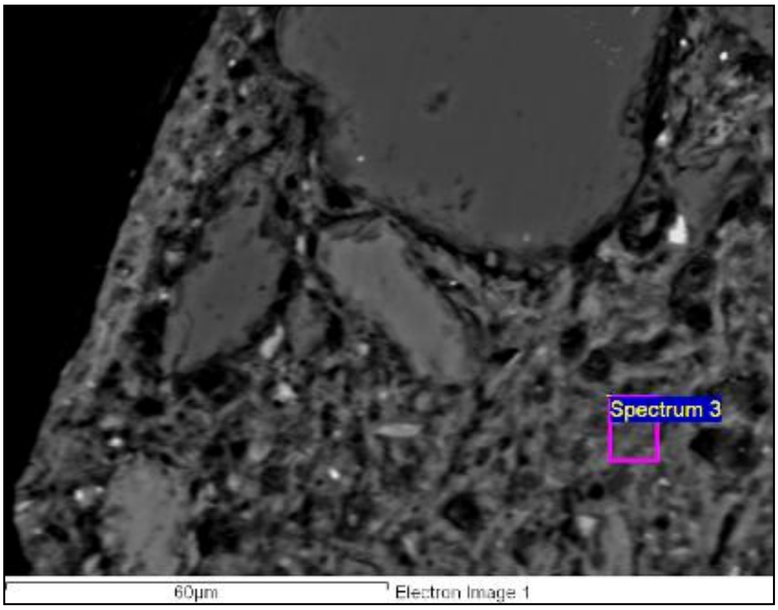


Figure IV.65. RP-7314 is made with fabric IV. Fabric IV consists of non-calcareous clays with iron compounds oscillating above 10%. The chemical composition of the clay consists of Na_2O (2.5%), MgO (4.0%), Al_2O_3 (17.9%), SiO_2 (60.2%), CaO (2.8%), TiO_2 (0.4%) and FeO (10.4%) (BSE, full scale: 60 µm).

Both fabrics IV and VIII are made with non-calcareous clays (**Figure IV.53**) and with an iron content ranging over 10% (**Figure IV.62, Table IV.6**). The relatively high concentration of iron compounds in the compositions of these fabrics is a result of two factors; iron naturally occurring in the clays (**Figures IV.64** and **IV.65**) and/or iron being part of the chemical composition of the inclusions within the clay matrices (**Figures IV.66** and **IV.67**). Both fabrics are coarse and characterised by the presence of large-sized inclusions, which in the case of fabric VIII reach 7 millimeters in long diameter. The main inclusion in fabric IV is biotite mica, while the presence of basalt fragments is also dominant. The same argument applies for fabric VIII, which is also characterised by the frequent presence of biotite, dolerites and basalts.

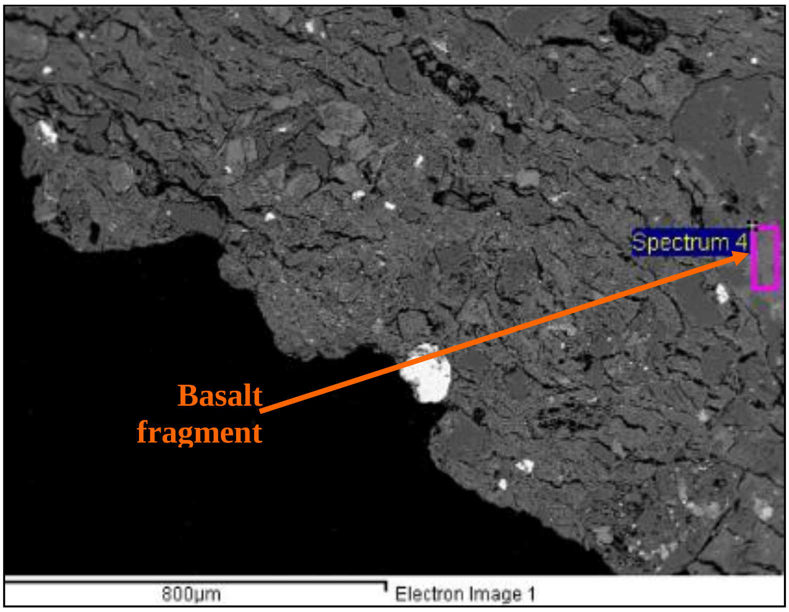


Figure IV.66. RPC-9176 is made with fabric VIII, an igneous fabric with a dominant presence of basalt fragments. In this measurement the chemical composition of the basalt fragment consists of Na_2O (0.6%), MgO (8.4%), Al_2O_3 (22.1%), SiO_2 (47.8%), K_2O (2.9%), CaO (1.0) and FeO (17.3%) (BSE, full scale: 800 μm).

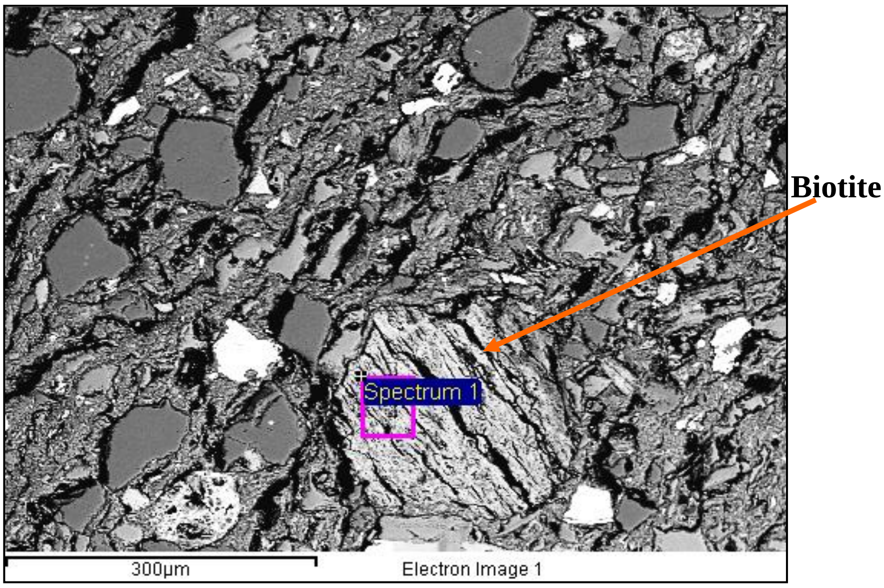


Figure IV.67. RPC-11478 is made with fabric VIII, an igneous fabric in the composition of which biotite mica is a frequent inclusion. In this measurement the chemical composition of the biotite fragment consists of MgO (8.4%), Al_2O_3 (11.0%), SiO_2 (51.6%), P_2O_5 (0.7%), K_2O (0.8%), CaO (3.9%) and FeO (23.5%) (BSE, full scale: 500 μm).

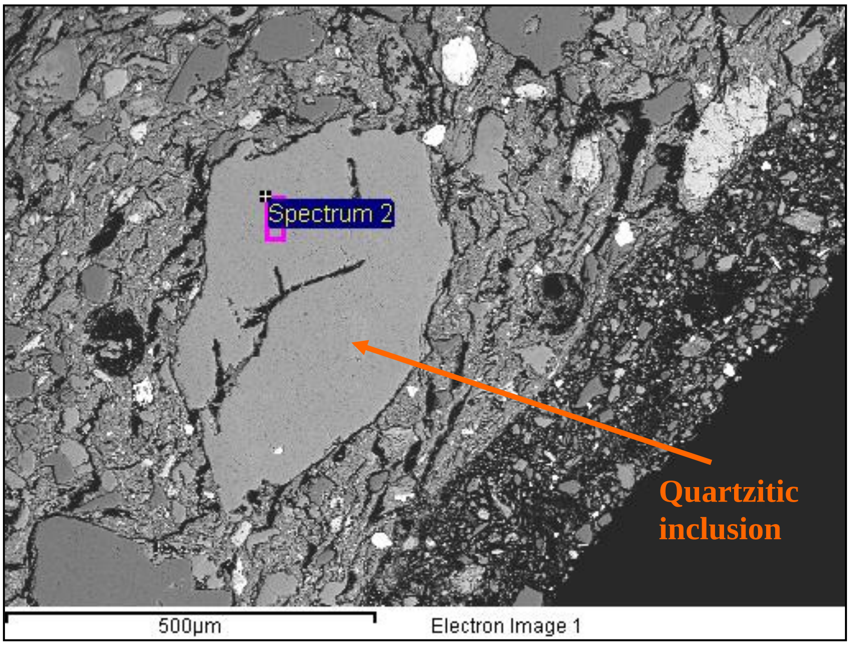


Figure IV.68. RPC-11478 is made with fabric VIII, an igneous fabric with a predominant presence of quartzitic inclusions. In this measurement the chemical composition of the quartz grain consists of Na_2O (4.2%), Al_2O_3 (27.7%), SiO_2 (55.1%), CaO (12.3%) and FeO (0.9%) (BSE, full scale: 500 µm).

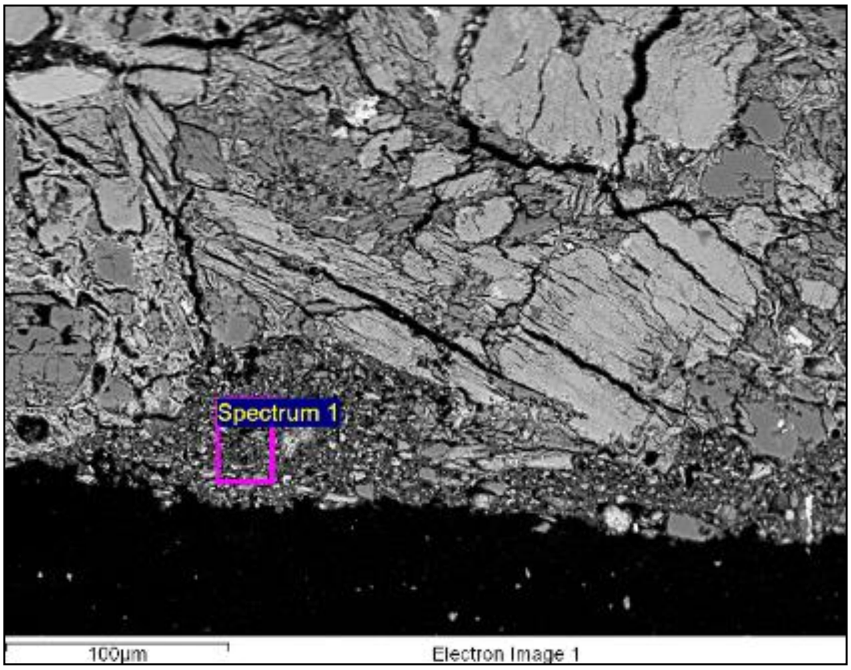


Figure IV.69. This photomicrograph of sample RP-15770 shows the large size of the inclusions characterising fabric VIII (BSE, full scale: 100 µm).

As has already been argued in the preceding section, the raw material sources for the production of fabrics IV and VIII should be sought in the same broad geological region. However, these are two distinctively different fabrics; while they incorporate the same type of igneous inclusions, their density and distribution differs greatly. From a mineralogical point of view, fabric IV is richer in biotite mica, while fabric VIII is richer in quartzitic inclusions (**Figure IV.68**). From a chemical point of view, fabric VIII is richer in iron than fabric IV (**Figures IV.51** and **IV.62**). It should also be noted that the samples made with fabric IV form a tighter chemical cluster than the samples comprising fabric VIII. The larger size of the inclusions in fabric VIII, in comparison with fabric IV, could be a result of a less-systematic processing of raw materials (**Figure IV.69** and **Figures IV.24.a** and **IV.25**), partially explaining this chemical inconsistency in fabric VIII, or it could be a result of natural variation in raw materials.

Fabrics IX and X differ in terms of fabric fineness and composition (**Appendix IV.3** and **Figures IV.29-IV.33**). While the raw materials used for their production belong to the broader geological region encircling the Troodos massif, fabric IX presents evidence for vegetal temper, it is characterised by a more dense presence of quartz grains and it is relatively coarser than fabric X, which in its turn is characterised by a more dense presence of biotite mica than fabric IX. From a chemical point of view the samples made with fabrics IX and X are very similar.

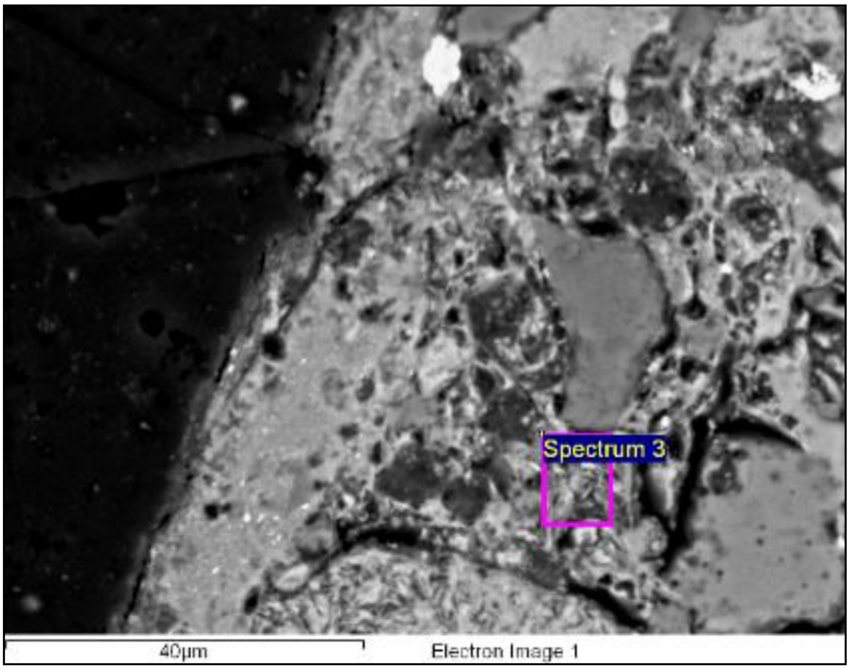


Figure IV.70. RP-5770 is made with fabric X. The composition of the clay with which this vessel is made consists of Na_2O (0.9%), MgO (8.0%), Al_2O_3 (10.8%), SiO_2 (58.3%), K_2O (0.7%), CaO (12.9%) and FeO (8.3%) (BSE, full scale: 40 µm).

The samples composing fabric X are both chemically and mineralogically very uniform. They are made with moderately calcareous clays, the concentration of CaO oscillates around 8% according to ED-XRF analysis (**Appendix IV.4.b, Table IV.5,**

Figure IV.53) and 11-12% according to SEM-EDS analysis (**Figures IV.70** and **IV.71**). As shown in **Figure IV.62** and **Table IV.6**, fabric X is rich in iron as the concentration of iron oxide in its composition surpasses 10%; mineralogically this can be explained by the use of iron-rich clays for the production of this fabric and the frequent presence of biotite mica in this fabric and other igneous inclusions.

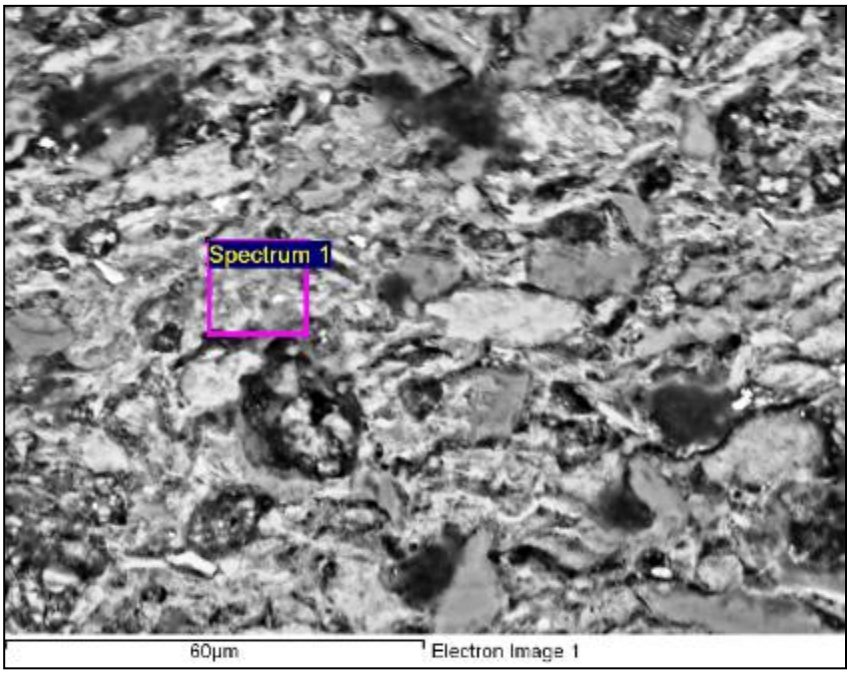


Figure IV.71. RP-6365 is made with fabric VIII. The composition of the clay with which this vessel is made consists of Na_2O (1.8%), MgO (5.5%), Al_2O_3 (12.8%), SiO_2 (58.8%), K_2O (1.3%), CaO (10.5%), TiO_2 (0.6%) and FeO (8.8%) (BSE, full scale: 60 μm).

RP-9242, made with fabric XI, is chemically differentiated from the other analysed samples having the lowest concentration of calcium oxide and being one of the richest analysed samples in iron oxide (**Figures IV.50** and **IV.51**). From a mineralogical point of view, fabric XI is distinguished for the reddish brown colour of the clay matrix and its strong igneous character, reflected in the dominant presence of dolerite fragments and absence of any calciferous material (**Figures IV.34** and **IV.35**).

The samples mineralogically allocated to fabric XIII are also chemically distinguished from all the other samples and form their own cluster (**Figures IV.50** and **IV.51**). SEM-EDS analyses confirm ED-XRF measurements that indicate that this is a fabric made with moderately calcareous clays in the composition of which calcium oxide varies between 8 and 14% (**Figures IV.72** and **IV.73**). This is a fine fabric (compare the size of the inclusion in **Figures IV.72** and **IV.73** with the size of the inclusions in **Figures IV.64** and **IV.69**), very homogeneous both mineralogically and chemically.

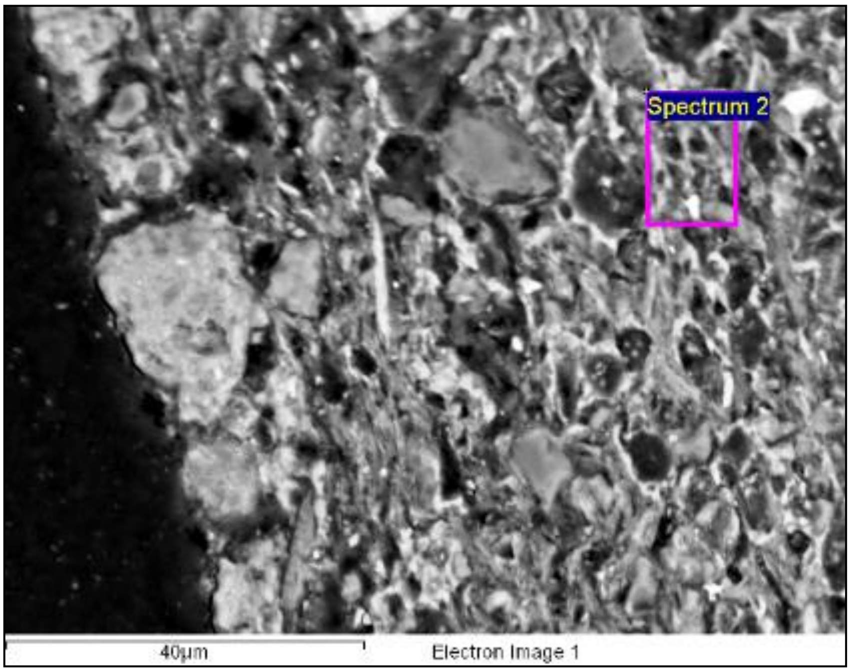


Figure IV.72. ERS-12456 is made with moderately calcareous fabric XIII. The composition of the clay with which this vessel is made consists of Na_2O (0.5%), MgO (4.5%), Al_2O_3 (16.2%), SiO_2 (61.1%), K_2O (2.1%), CaO (10.7%) and FeO (5.0%) (BSE, full scale: 40 µm).

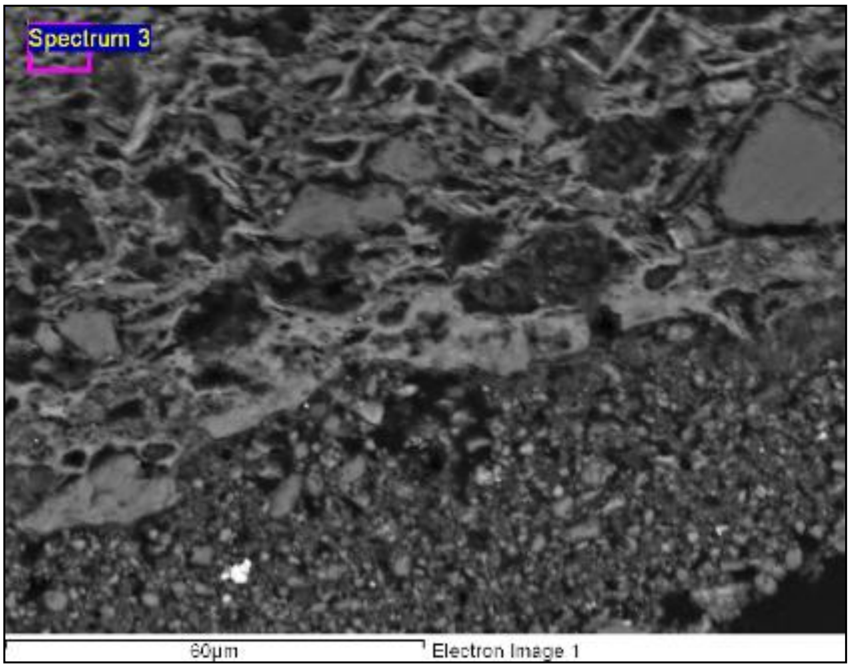


Figure IV.73. ERS-16534 is made with moderately calcareous fabric XIII. The composition of the clay with which this vessel is made consists of Na_2O (1.0%), MgO (3.7%), Al_2O_3 (19.3%), SiO_2 (51.6%), K_2O (2.5%), CaO (13.4%), TiO2 (0.7%), FeO (6.7%) (BSE, full scale: 60 µm).

The understandable relationship between the chemical and mineralogical analyses suggests that the analytical results can be used with some confidence. While considerable mineralogical and chemical consistency characterises fabrics I, III, V, X and XIII, and to a lesser extent fabric IV, fabrics II, VI, VIII and XII have a looser chemical definition[40]. This division between more consistent and less consistent compositions could be partially explained in terms of raw material natural variation and/or subsequent processing. The collection of raw materials from alluvial deposits, for example, could explain the presence of more diverse chemical and mineralogical compositions within fabrics, whereas greater compositional consistency can be the result of more systematic raw material selection and processing during ceramic production.

However this rationale cannot be used to explain the chemical diversity of fabric XII. Despite the fact that the vessels composing this group are made with fine clays, which obviously were processed thoroughly, they do not form consistent chemical groupings. It is, therefore argued that the mineralogical similarity between these vessels is achieved due to the employment of similar techniques for their production and the use of similar raw materials by different workshops, rather than their production using raw materials from the same geological source by a single production centre. It is, hence, important to investigate further below what types and styles of vessels compose fabric XII, and how this technological uniformity can be interpreted.

This type of investigation will also be made for all fabrics, in order to verify whether there are any compositional (chemical and/or mineralogical) associations with specific ceramic types or styles, and whether these potential associations serve specific aspects of the vessels' function, and if they change through time during the lifespan of Marki. This type of investigation will contribute to the assessment of the EC-MC potters' technological choices and knowledge of raw material physical properties and type vessel requirements for durable pot use-life. This investigation was conducted by integrating the results of macroscopic and microscopic analyses; this exploration will follow two technological studies of ceramic slips and firing temperatures.

[40] Only two samples made with fabric IX and one sample made with fabric XI were analysed with ED-XRF, so neither could be assessed for fabric consistency.

IV.2.c. A technological study of ceramic slips.

SEM-EDS technology was used for the chemical characterisation of ceramic slips (**Appendix IV.5**). This method was employed in order to assess the raw materials and techniques used for the production of the ceramic slips, and if and how these change during the Philia, EC and MC periods. Moreover, this study was done in order to examine whether any chemical consistency in the composition of ceramic slips can be associated with specific fabrics, as defined by petrography.

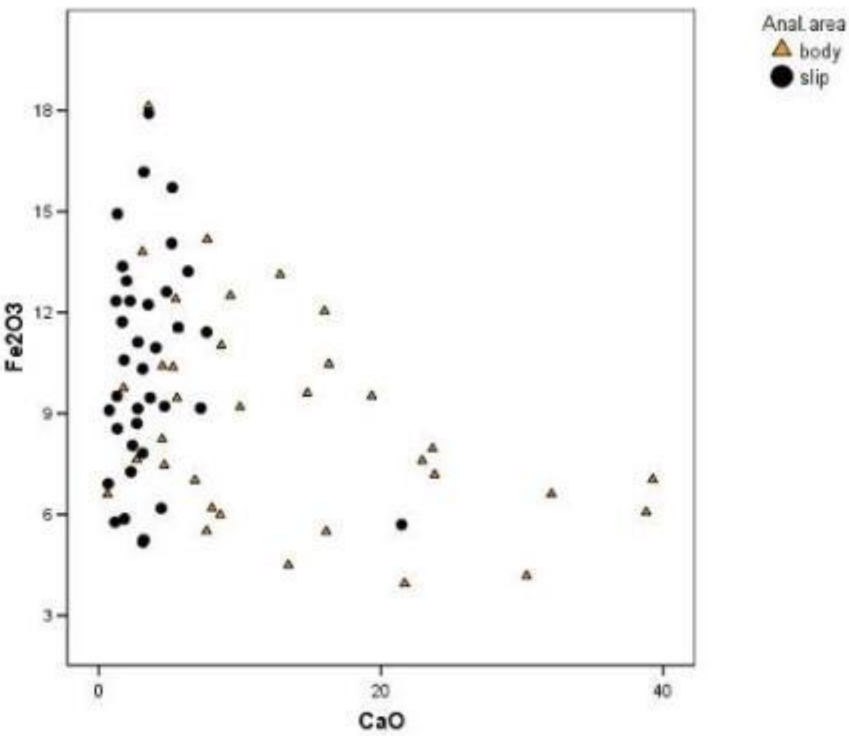


Figure IV.74. Simple scatterplot showing the relationship between slips and ceramic bodies based on their calcium and iron oxide concentrations, as determined by SEM-EDS and ED-XRF respectively. As this scatterplot shows, there is a systematic exploitation of non-calcareous clays, rich in iron oxides, for the production of ceramic slips, whereas the ceramic bodies show the use of both calcareous and non-calcareous clays.

The main objective was to collect representatives from both fine and coarse vessel types of pottery, including cooking pots, from the Marki sample. For this particular technological study, the thickness and preservation of slip layers were significant factors affecting sample collection. It should be noted that most of the RPC and some of the PRS samples are unslipped and that the slip layers on the ERS vessels are very thin. With these considerations in mind, and focusing on the RP as the main class of pottery in the Marki samples, 55 samples, which include 30 RP, 15 RPP, 3 RPC, 2 WPP, 2 PRS and 3 ERS, were analysed for this particular technological study. The samples were chosen primarily for their thick slip layers.

Overall, the clays used for the production of ceramic slips are in all cases non-calcareous (CaO 1-7%), rich in iron-oxide (Fe_2O_3 6-18%), and richer in potash than the clays used for the manufacture of the vessels' bodies. **Figure IV.74**[41]. This selective use of non-calcareous, iron-rich clays is observed diachronically, on all kinds of fabrics (both calcareous and non-calcareous bodies), from all phases of the settlement.

The SEM-EDS dataset was manipulated using PCA and hierarchical clustering. The two principal components, accounting for 59.5% of the total variation, were used. Soda was not included in PCA (**Figure IV.75**) because of the sensitivity of the SEM-EDS in light elements as discussed in Chapter II. **Figures IV.76-IV.79** show that there are some small clusters of samples grouped together, even though this is not the kind of consistency observed in relation to the fabrics used for the ceramic bodies. These small chemical clusters are more evident in **Figures IV.80** and **IV.81,** as the clusters of samples in the dendrograms illustrate some meaningful links among the samples, related either to the fabric with which the ceramic bodies are made or the wares to which the vessels belong.

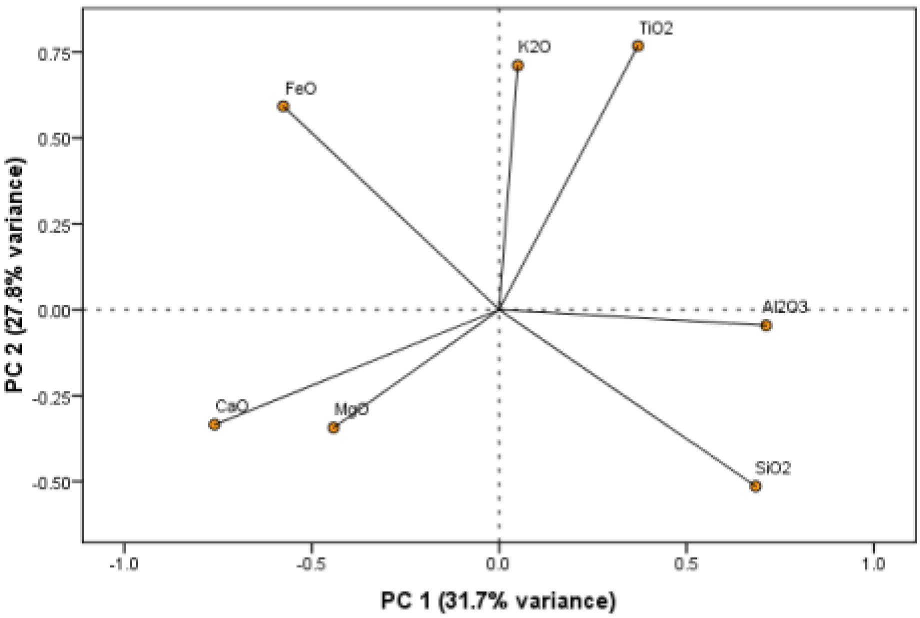


Figure IV.75. PCA plot showing the contribution of individual compounds to the two principal components in the overall variation among the chemical composition of the samples' slip layers.

[41] For this particular graph, FeO values provided by SEM-EDS for slip analysis were converted to Fe_2O_3 in order to become comparable with ED-XRF measurements of ceramic bodies.

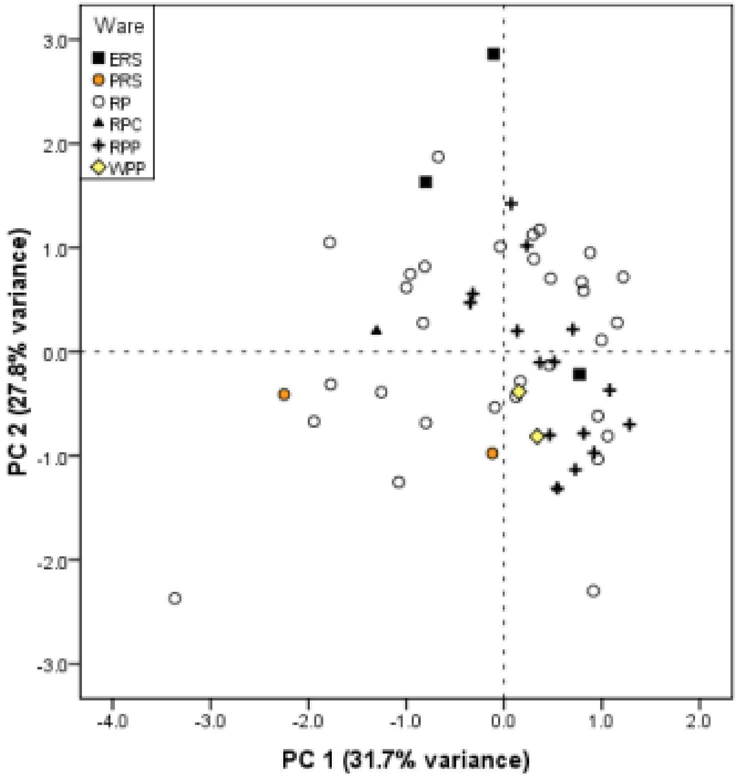


Figure IV.76. PCA scatterplot illustrating the chemical variation in the vessels' slip composition, as recorded by SEM-EDS. The samples are marked according to the ceramic ware to which they belong.

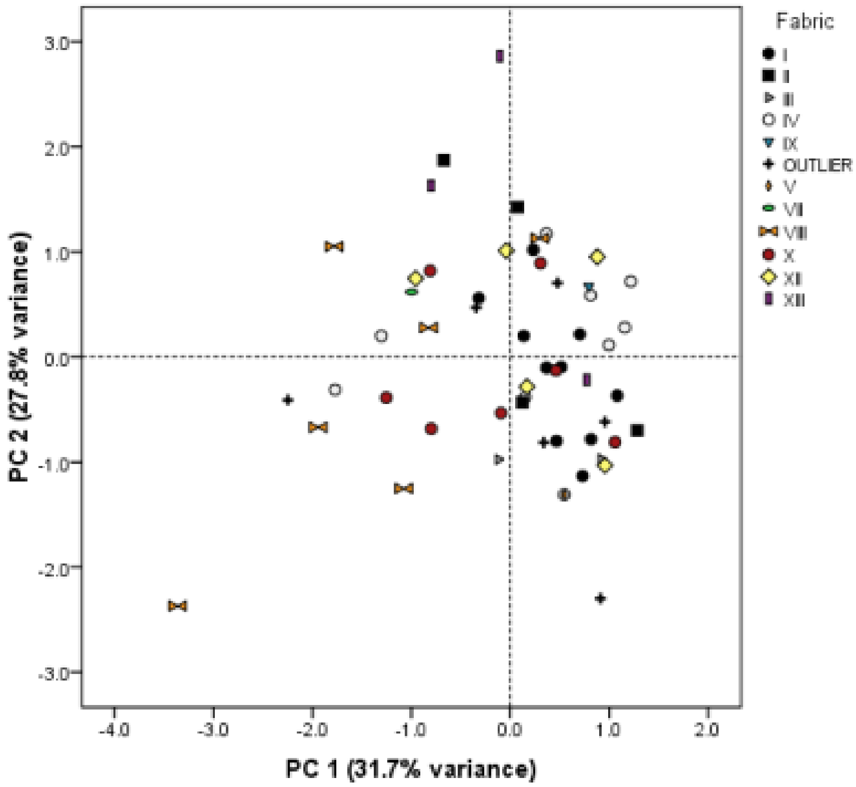


Figure IV.77. PCA scatterplot illustrating the chemical variation in the vessels' slip composition, as recorded by SEM-EDS. The samples are marked according to the ceramic fabric with which they are made.

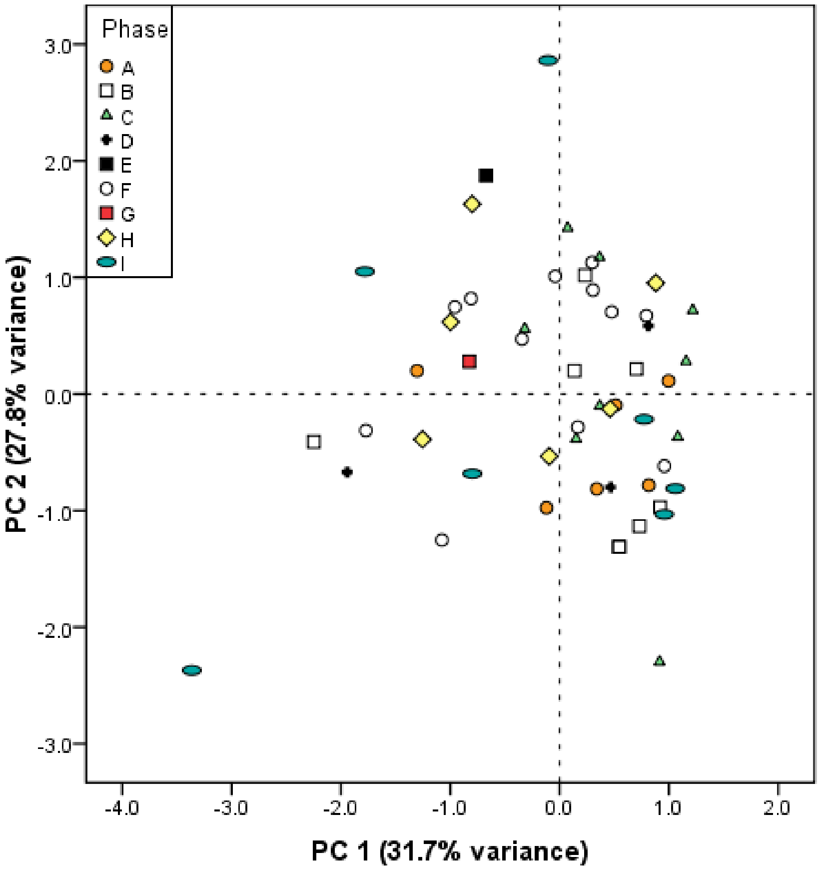


Figure IV.78. PCA scatterplot illustrating the chemical variation in the vessels' slip composition, as recorded by SEM-EDS. The samples are marked according to the occupational phase in which they were recovered.

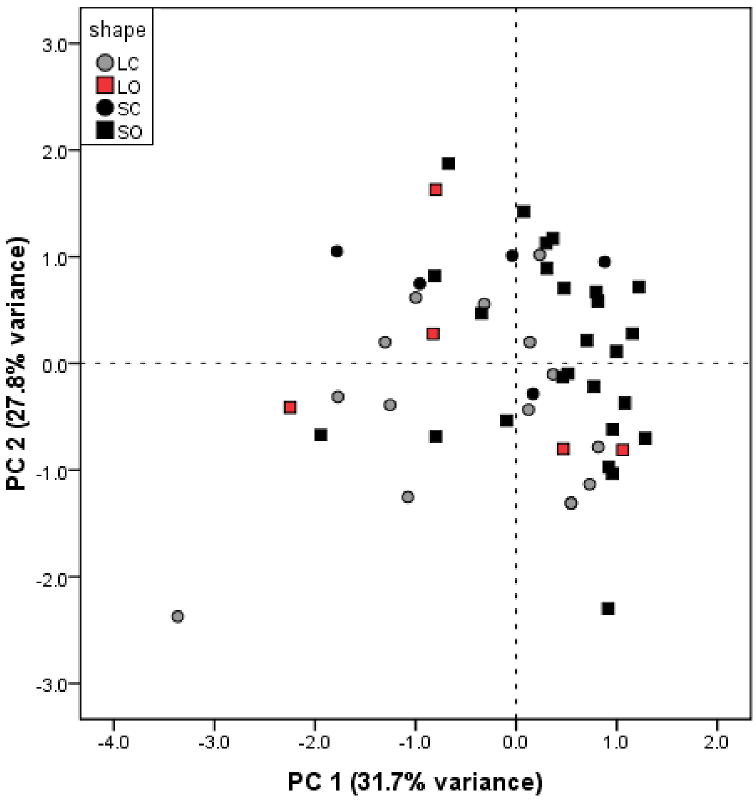


Figure IV.79. PCA scatterplot illustrating the chemical variation in the vessels' slip composition, as recorded by SEM-EDS. The samples are marked according to vessel shape.

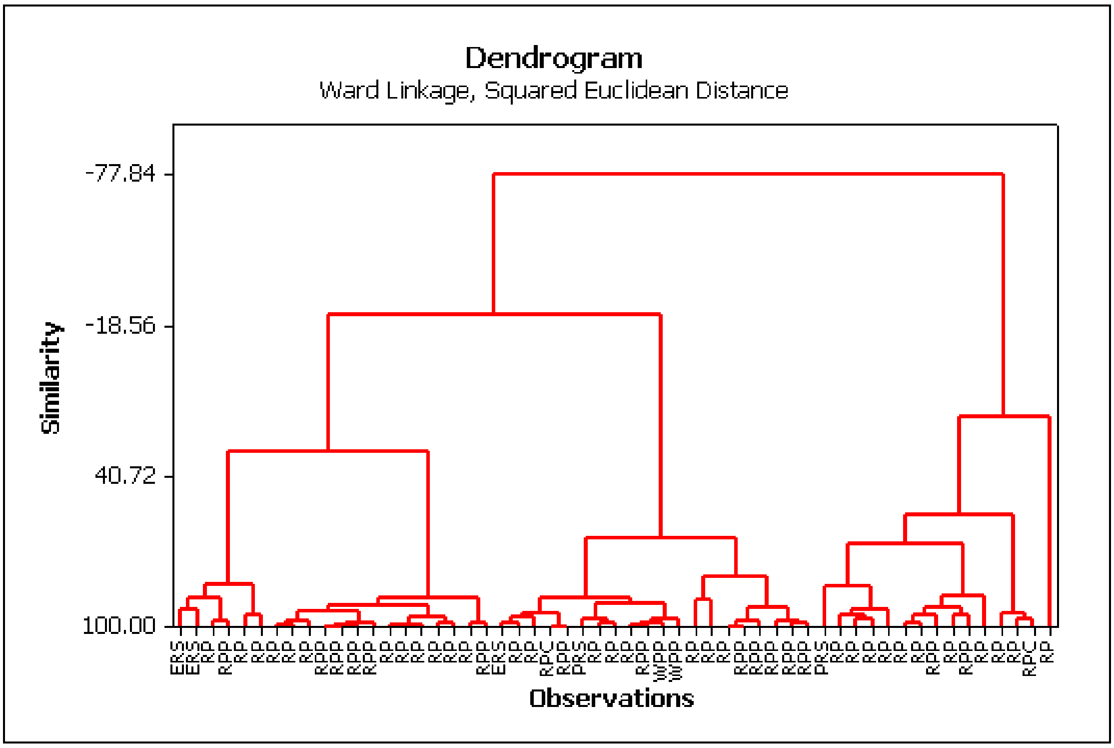


Figure IV.80. Hierarchical cluster analysis of the SEM-EDS dataset.

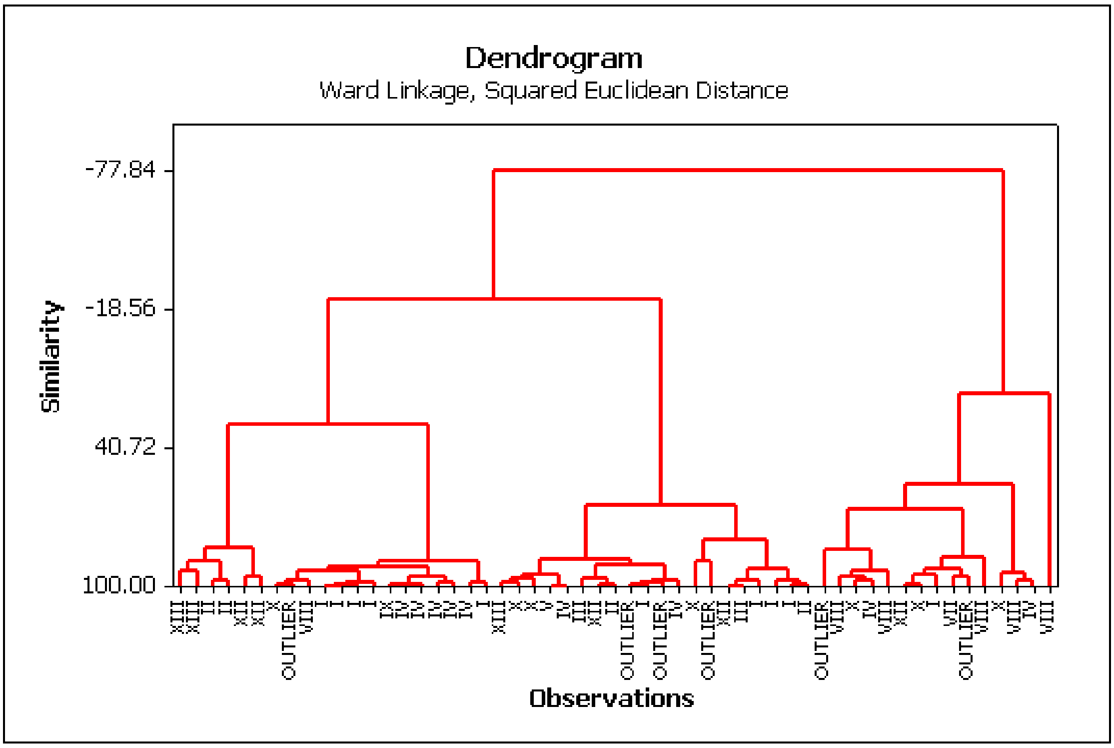


Figure IV.81. Hierarchical cluster analysis of SEM-EDS dataset. The dendrogram indicates that chemical variation exists even in the slip composition of vessels allocated by petrography to the same fabric.

Considering the RP black-topped sub-variety, it is generally agreed that the differentiation in colour on these vessels' surfaces is a result of a specialised firing procedure, and differing firing atmospheres. Mössbauer spectroscopy and quantitative chemical analyses[42] of samples coming from a single EC II RP II black-topped bowl, published by Anna Wærn-Sperber, indicated that the iron in the slip composition of this variety of RP is the main cause of the variation in colour (Wærn-Sperber 1988, 195, 197). Moreover, Wærn-Sperber's study indicated that haematite, subjected to strongly oxidising firing, could be the source of the red colour of these vessels' lower half, and that the upper black half was achieved by reducing conditions, during which the iron on the surface had undergone some changes (Wærn-Sperber 1988, 197).

The present analytical dataset reinforces the argument that ferrous clays were used for the production of this sub-variety of RP ware, but also for the production of all red-coloured ceramic slips. However the black-topped vessels' slip compositions were not characterised by the highest iron values in the sample. On the contrary, the slip composition of RP-12193, which is a black-topped small bowl, is characterised by the lowest value in iron oxide among all the analysed samples.

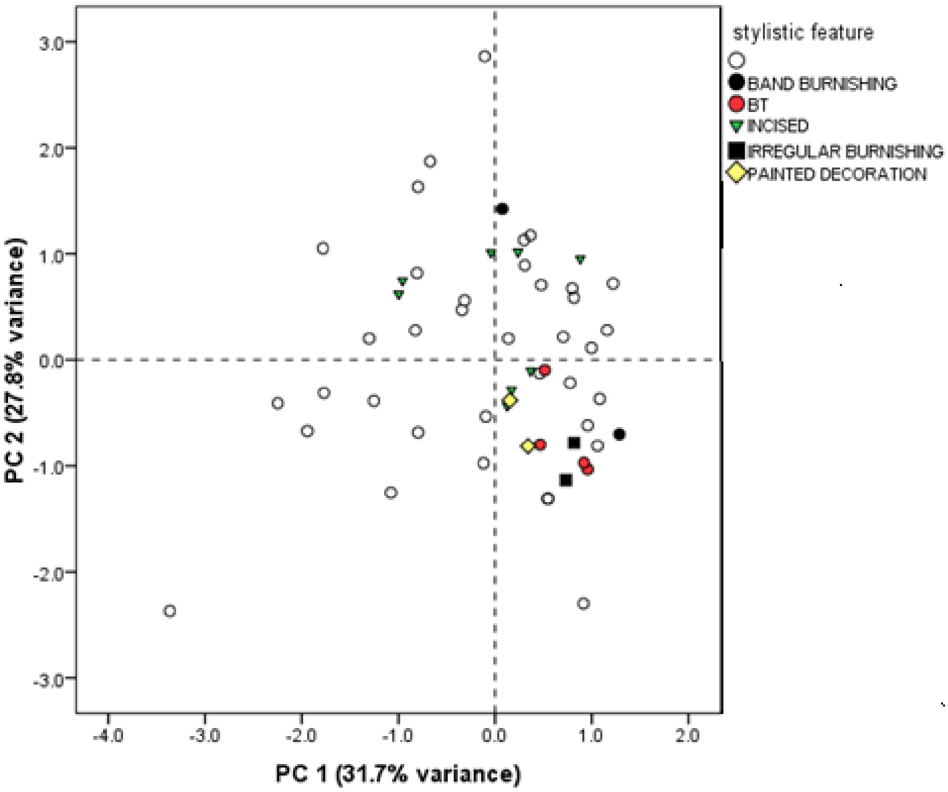


Figure IV.82. PCA scatterplot illustrating the chemical variation in the vessels' slip composition, as recorded by SEM-EDS. Samples are marked according to their particular stylistic features (Open circle symbol represents samples without any distinct stylistic feature – BT: Black-topped sub-variety).

[42] The publication (Wærn-Sperber 1988) does not mention the exact type of quantitative chemical analyses conducted.

Some similarity in slip composition is shown among samples with differing stylistic features in **Figure IV.82**. However, samples grouped together in **Figure IV.82** are not necessarily made with the same fabrics as defined by petrography (**Figure IV.77**), and therefore no further correlations are obvious. With reference to the ceramic slips, the only systematic aspect in their production is in the use of ferric, non-calcareous, thoroughly levigated clays. The clays used for the slip on cooking pots seem to have been less thoroughly processed, but again they are still more thoroughly processed than the clays used for the production of the pots' bodies (**Figure IV.83**).

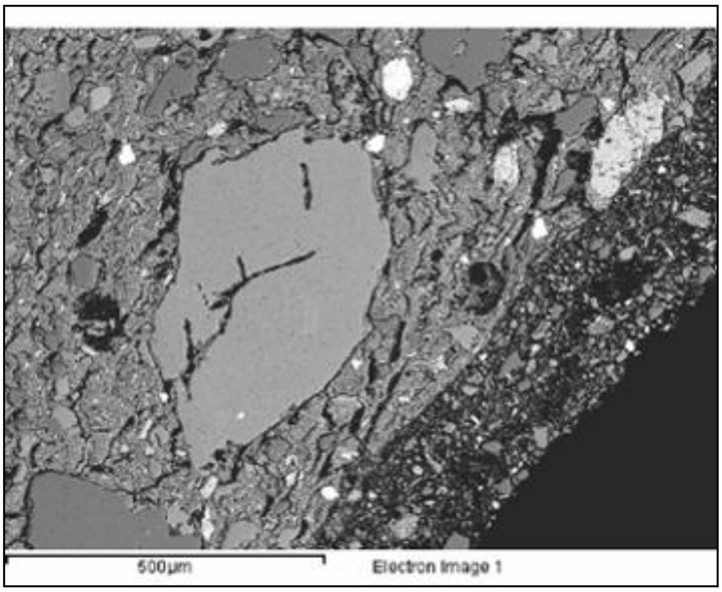


Figure IV.83. The coarser slip layer on cooking pot RPC-11478 (BSE, full scale: 500 µm).

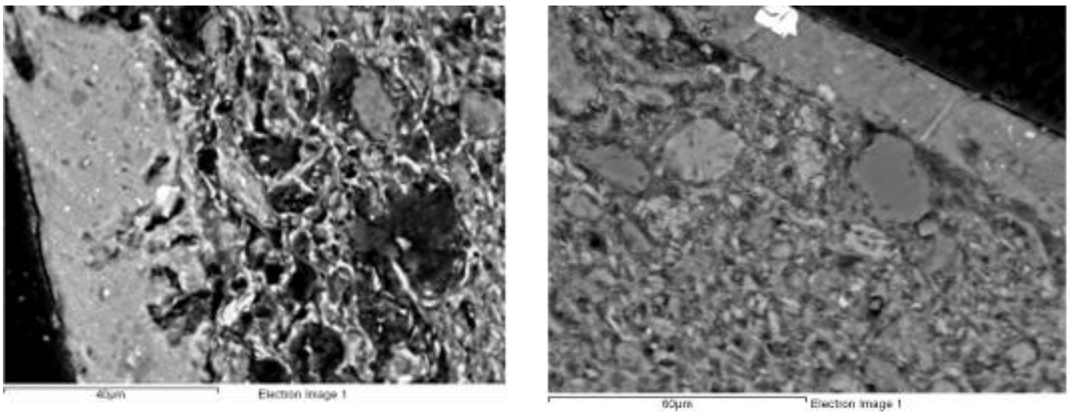


Figure IV.84. a-b. SEM photomicrographs demonstrating the fine slip layers of **a.** ERS-12456 (BSE, full scale: 40 µm) and **b.** RP-4351 (BSE, full scale: 60 µm). Slip production techniques seem to remain unchanged during EC and MC periods .

Despite the use of a varying range of non-calcareous, ferric clays for their production, the analytical study of slip layers coming from samples from different occupational phases shows that for the production of ceramic slips a common, widespread recipe was followed, which was applicable to all wares. Moreover, the clays used for the production of slips seem well-processed by means of levigation or sieving **(Figures IV.84. a-b** and **IV.85).** It should also be stated that the bright, white-coloured particles visible in the slip areas in **Figure IV.84. a-b** are haematite grains, which as Wærn-Sperber (1988) has argued were ground and mixed with the fine clay to make it redder during firing.

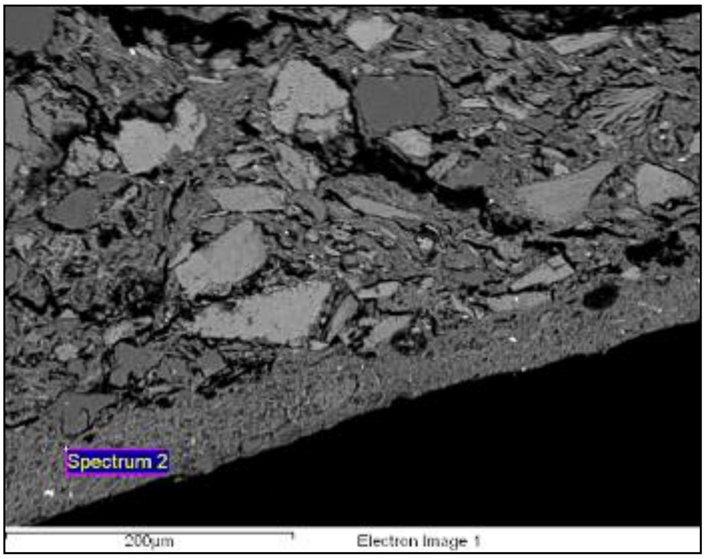


Figure IV.85. The fine slip layer of RP-16541 in contrast to the less thoroughly processed vessel's body (BSE, full scale: 200 µm).

During the technological study of the ceramic slips, there was also an opportunity to characterise the composition of the white filling used as part of the incised decoration on RP vessels. In those cases where the white filling was preserved, it was located above the slip layer within the incision, indicating that the vessel was first incised, then slipped and finally decorated with the white filling (**Figure IV.86**). SEM-EDS analysis of white filling remnants found in an incision of RP-4864 has shown that its composition is 1.7% magnesium oxide, 3.3% alumina, 13.6% silica, 79.2% calcium oxide and 2.6% iron oxide, thus suggesting that the substance used for the production of this white filling was mainly limestone.

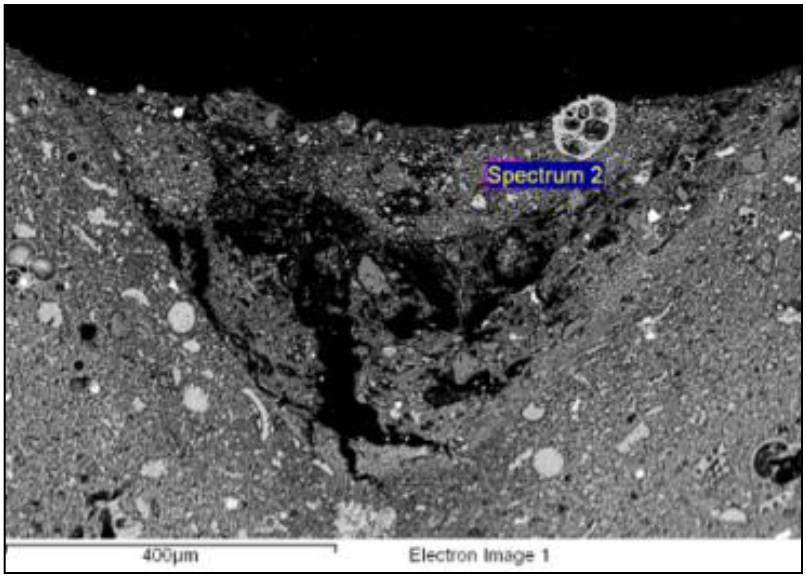


Figure IV.86. SEM-EDS analysis of the white filling in the incisions of RP-4864 has shown that the substance used was lime (BSE, full scale: 400 μm).

IV.2.d. A note on firing temperatures.

The collection and study of high magnification, secondary electron images from samples coming from all different wares, fabrics, and occupational phases at Marki suggests that firing temperatures remained low throughout the EC and MC periods. This is evidenced in the absence of vitrification in the samples of both earlier and later phases of habitation and the presence of the same flaky structures and absence of any threads of glass within the clay structures (**Figures IV.87-IV.96**[43]).

Maniatis *et al*. (1982, 193-194) have argued that

> "in the case of the completely unvitrified sherds the SEM cannot define firing temperature ranges except to specify the upper limit, i.e. 750°C, since this is the lower temperature where vitrification can possibly appear".

Therefore, the completely unvitrified clay matrices of all analysed samples from Marki indicate that firing temperatures of different wares, different fabrics, shapes of vessels and even from different periods within the Philia, EC and MC chronological spectrum did not exceed 750°C. However, it should be noted that any differentiations recorded in the degree of fabric hardness, colour of exterior and interior surfaces, and texture could be linked with the duration of firing and firing atmospheres, as well as

[43] For the degree of vitrification of the clay particles of RPP samples from Marki see chapter III, section III.3.d.

the fluctuation and maintenance of maximum temperatures during firing. This technological study of firing temperatures only determines the maximum temperatures achieved during the EC and MC periods, as shown at Marki.

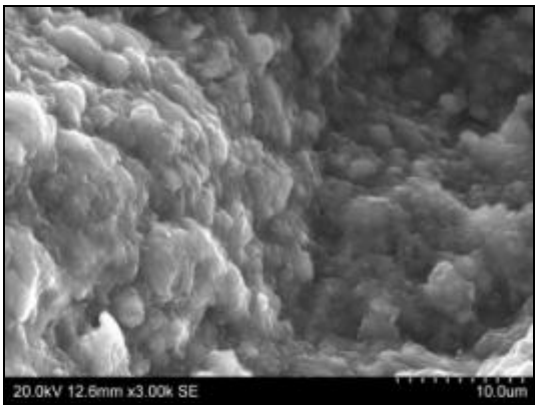


Figure IV.87. SEM photomicrograph demonstrating the degree of vitrification of WPP-14401, phase B (SE, full scale: 10 um).

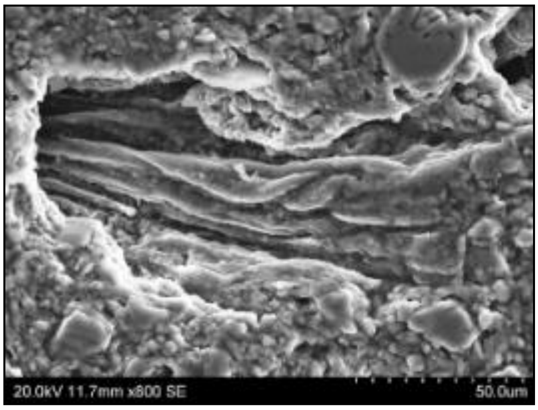


Figure IV.88. SEM photomicrograph demonstrating the degree of vitrification of PRS-16466, phase C (SE, full scale: 50 um).

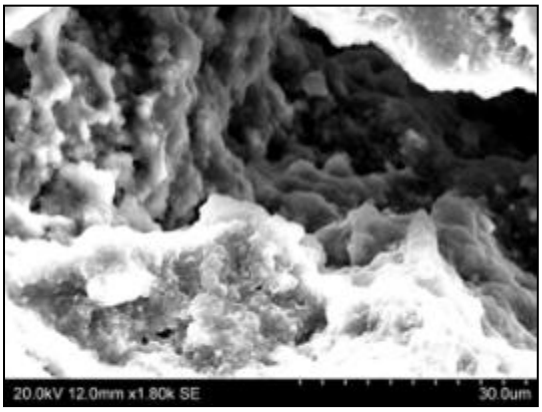


Figure IV.89. SEM photomicrograph demonstrating the degree of vitrification of WPP-16234, phase C (SE, full scale: 30 um).

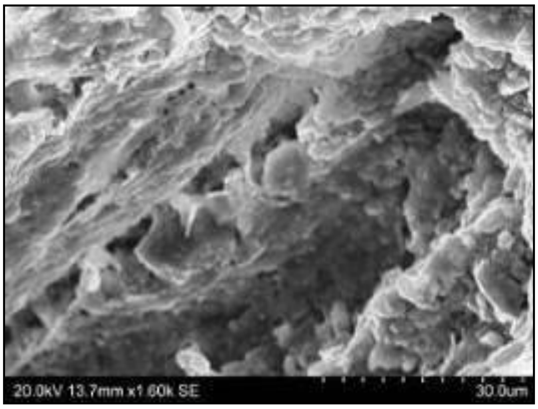


Figure IV.90. SEM photomicrograph demonstrating the degree of vitrification of ERS-5812, phase F (SE, full scale: 30 um).

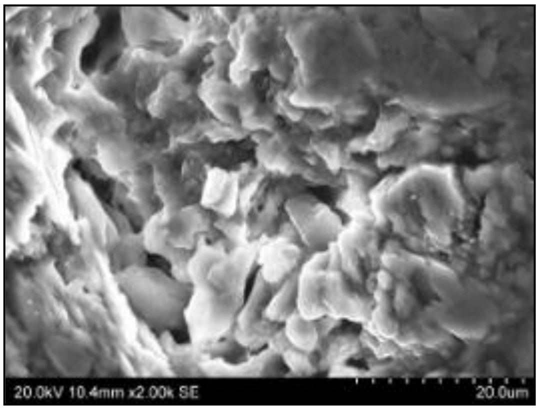


Figure IV.91. SEM photomicrograph demonstrating the degree of vitrification of RPC- 12940, phase F (SE, full scale: 20 um).

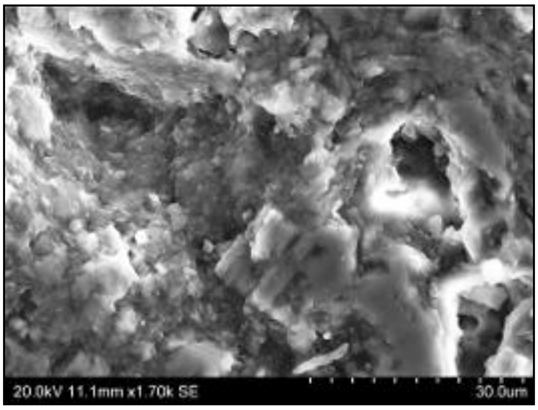


Figure IV.92. SEM photomicrograph demonstrating the degree of vitrification of RP-5826, phase F (SE, full scale: 30 um).

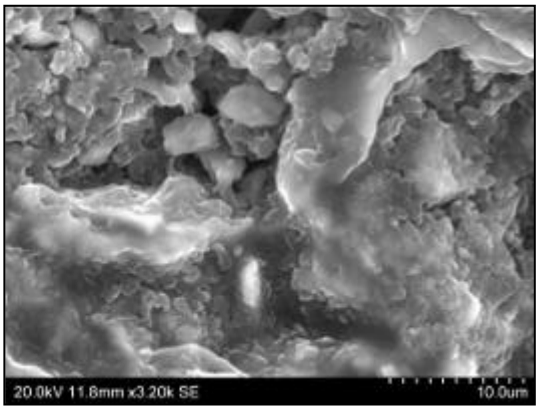


Figure IV.93. SEM photomicrograph demonstrating the degree of vitrification of RP-13007, phase G (SE, full scale: 10 um).

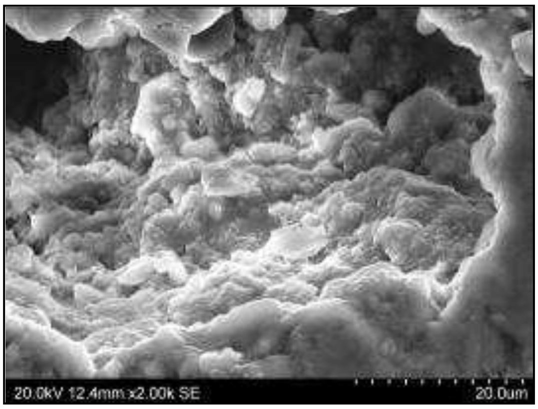


Figure IV.94. SEM photomicrograph demonstrating the degree of vitrification of RP-5770, phase H (SE, full scale: 20 um).

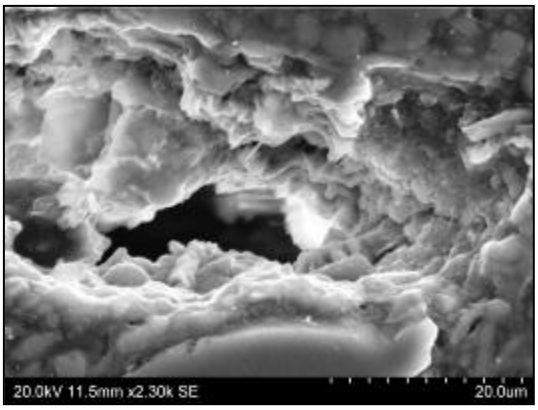


Figure IV.95. SEM photomicrograph demonstrating the degree of vitrification of RP-12193 (black-topped), phase I (SE, full scale: 20 um).

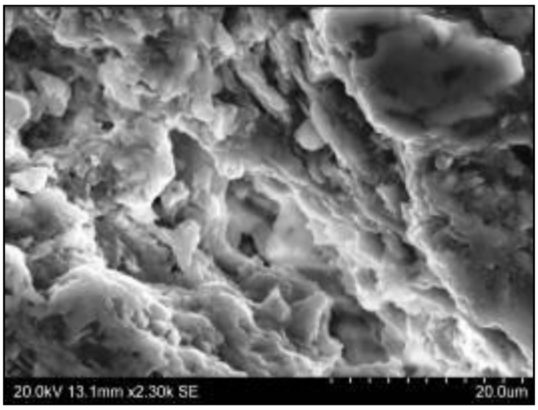


Figure IV.96. SEM photomicrograph demonstrating the degree of vitrification of RP-15481, phase I (SE, full scale: 20 um).

Finally, another indication strengthening further the argument about the low firing temperatures reached is the good preservation of microfossils in the vessels' clay matrices. In **Figures IV.56, IV.57** and **IV.63**, the well-preserved shelly structures and shapes of the microfossils and other types of microfossils suggest that the firing temperatures were not high enough for these shells to decompose or deform, but that they rather remained low enough not to affect them.

IV.3. Integrating datasets towards archaeological interpretation.

The analytical study of the 185 samples from Marki, including a variety of coarser and finer wares, has provided a significant corpus of data from which many inferences can be made about both local production and ceramic imports. Being the first large-scale multi-analytical attempt to study Philia, EC and MC pottery from the successive strata of a single settlement, this study can inform a diachronic consideration of pottery making at a Philia/EC-MC community.

Having in mind that the sample under study is mainly representative of the local production at Marki, **Table IV.7** shows the chronological distribution of the thirteen fabrics defined by petrography, according to the occupation phase in which the respective vessels were found. Fabrics I, III and V include primarily material dated to the Philia phase, even though their production does not seem to sharply cease in EC. Within these fabrics, samples recovered in phases C and even D could belong to an extensive use of these primarily Philia fabrics in subsequent periods with some overlap in use with later ceramic types, while other samples, especially those recovered in phases E to H, could be residuals in totally strange to them contexts, originally coming from the Philia strata. This is justified by the typological characteristics of these residual specimens, which they clearly belong to RPP, PRS and WPP wares, even though they were found in EC III and MC I-II contexts.

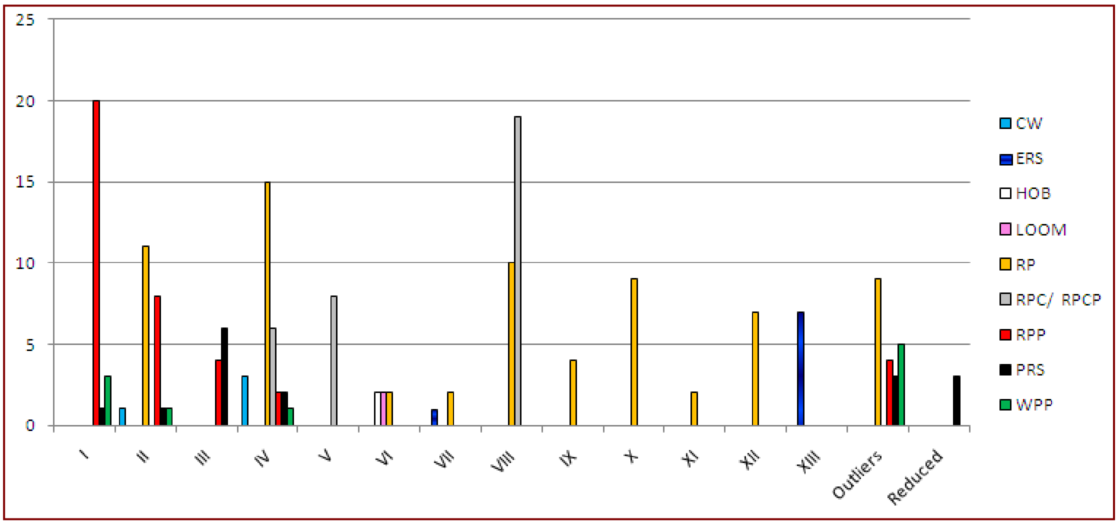


Figure IV.97. The typological distribution of the Marki fabrics (graph based on **Table.IV.8**).

Whereas some of the fabrics, such as II and VI, seem to have been in use throughout the lifespan of the settlement, others, namely VII, IX, XII and XIII, were introduced in phase F, that is from EC III onwards (**Table IV.1**). Most of the samples in fabric IV belong to phases A to D, which shows that this fabric was mainly in use during the earliest periods of the settlement and until EC II. Finally, the production of fabric VIII seems to have started in the earlier periods of the settlement, but its production intensified in EC II.

Period	Phase	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	Outliers	Reduced	Totals	%
Philia	**A**	4	2	2	5	2			1						1		17	**9**
Philia	**B**	7	2	1	3	3						1			3	1	21	**11**
EC I	**C**	7	4	2	6	1			1						8	2	31	**17**
EC I – II	**D**	2	1	2	4	2	1		4						2		18	**10**
EC III	**E**	1	2		3		1		3				1				11	**6**
EC III	**F**	2	6		7		3	1	4	1	2		4	2	4		36	**19**
MC I – II	**G**	1	2		2		1		7		1	1			1		16	**9**
MC I – II	**H**			3				2	4	1	4		1	1	1		17	**9**
MC I – II	**I**								5	2	2		1	4	1		15	**8**
	?		3														3	**2**
	Totals	24	22	10	30	8	6	3	29	4	9	2	7	7	21	3	185	
	%	**13**	**12**	**5**	**16**	**4**	**3**	**2**	**16**	**2**	**5**	**1**	**4**	**4**	**11**	**2**		

Table IV.7. The chronological distribution of the Marki fabrics (pink-coloured cells indicate potentially residual Philia sherds in later periods).

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	Outliers	Reduced	TOTAL	%
CW		1		3												4	**2**
ERS							1						7			8	**4**
HOB						2										2	**1**
LOOM						2										2	**1**
RP		11		15		2	2	10	4	9	2	7		9		71	**38**
RPC/ RPCP				6	8			19								33	**18**
RPP	20	8	4	3										4		39	**21**
PRS	1	1	6	2										3	3	16	**9**
WPP	3	1		1										5		10	**5**
TOTAL	24	22	10	30	8	6	3	29	4	9	2	7	7	21	3	185	
%	**13**	**12**	**5**	**16**	**4**	**3**	**2**	**16**	**2**	**5**	**1**	**4**	**4**	**11**	**2**		

Table IV.8. The typological variation within the Marki fabrics

Table IV.8 and **Figure IV.97** show the typological variation within the Marki fabrics. The table and graph show that while some fabrics are used variably for the production of different wares, others are used exclusively for a single type of pottery. Fabric I includes RPP, PRS and WPP. This shows that fabric I was variably used for the production of all three Philia wares. A similar argument is made for fabric III, which is used for the production of both RPP and PRS wares. Fabrics II and IV seem to be the two fabrics variably used for the production of a range of ceramic types. Fabric II is used for the production of RPP, PRS, WPP and RP, while fabric IV is used for the production of RP, RPP, WPP, PRS and RPCP/RPC. These seem also to be the only two fabrics with continuous use from the Philia to the EC period (**Table IV.7**).

The small number of hob and loomweight fragments prohibits confident argumentation that these types of artefacts were made exclusively with fabric VI, even though it is possible, as similar raw materials to those used for the production of fabric VI are found in the vicinity of the settlement (**Appendix I**) implying local production with raw materials readily available in the surrounding environment. A more confident argument can be built for cooking pots. RPCP and RPC are made with three different fabrics, namely IV, V and VIII (**Table IV.8**). RPCP Type a is made exclusively with fabric V, while RPCP Type b is made exclusively with fabric IV. After EC I, RPCP Type a ceases to be used at Marki (**Table IV.7**) and RPCP Type b evolves into the standard type of EC III cooking pot which gradually starts to be made with fabric VIII, the standard fabric used for cooking pots from EC III onwards.

Fabric XIII is used only for the production of ERS and fabric XII for the production of finely incised RP and RP black-topped vessels (**Figure IV.97**). Fabrics IX, X and XI are used for the production of a range of RP shapes. All the identified fabrics within the Marki sample seem to be used for the production of RPP and/or RP pottery, except fabrics V and XIII which were used exclusively for the production of RPCP Type a and ERS pottery respectively. These observations raise additional questions about the provenance of the identified fabrics.

The distinction between local and imported fabrics is based on various criteria, including the mineralogical characteristics of each fabric in relation to the geological zone in which Marki is located, the typological variation within each fabric, the chronological span of its use, and its compositional homogeneity. An introduction to the island's geology was made in the preceding chapter (section III.4). Marki is located at the contact line between the basal group and the overlying pillow lava series of the Troodos massif, with the adjacent, more recent sediments of the central plain (Gass 1960). Northeast of the settlement, the Alykos River traverses these different geological series, collecting and depositing a large variety of rock particles and soils. This alluvial mélange was and still is easily accessible along the extent of the river.

The mineralogical composition of the soil samples (**Appendix I**) reflects the geological variety encircling the settlement, on the border between the igneous and sedimentary deposits. Specifically, the soils from the area around Marki are characterised by a textural variation in the form of igneous minerals and rocks, a number of microfossil tests, and micritic limestone inclusions. These components can be found either in isolation or in combination within a single sample's clay matrix and as has already been explained, are representative not only of the area where Marki is located, but the broader central-south Troodos region. Nonetheless, even though it was not possible to argue which of the analysed samples were locally made at Marki simply by focusing on their compositional characteristics, the combination of typological and compositional characteristics proved more fruitful.

Table IV.8 indicates that all sampled hobs and loomweights were made with fabric VI, the raw materials for the production of which, as argued, were collected from alluvial deposits by the Alykos River in the vicinity of Marki. This fabric presents compositional similarities with soil samples collected from the area surrounding Marki, and in particular the river sediments of the Kotsiatis dam (**Appendix I**, **Figure IV.17**). Moreover, the fragile nature of the hobs and loomweights, which were either low-fired or only sun-dried prior to use (Frankel and Webb 2006, 175), suggests that these artefacts were not suitable for transportation and inter-site exchange, and were thus produced locally. The presence of RP pottery in fabric VI (RP-7307 - a large-closed vessel and RP-14262 - a pan) indicates that the corresponding fabric was used also for the production of RP everyday utilitarian pottery.

Fabric II consists of a mealing bin (CW-9207), two pans (RP-7173 and RP-7464) and a series of RP vessels, including four bowls, four large closed vessels, two of which are incised (RP-11359 and RP-12361), and a small closed vessel. The presence of the mealing bin and two pans in fabric II bestows a utilitarian character to the corresponding fabric. As has already been argued, fabric II is very similar to fabric

VI but relatively finer. Their main differences include the smaller sizes of the inclusions present in fabric II and the lower densities of micritic limestone also in fabric II. Apart from these differences, fabric II shares common mineralogical characteristics with fabric VI. Both fabrics are characterised by the presence of calcite-filled microfossils (**Figure IV.14** and **IV.18**), an indication that the raw materials for the production of these fabrics could originally have formed in a common marine environment.

Considering the types of ceramics included in the two fabrics, their similar mineralogy and limited mineralogical differences, it could be argued that fabrics VI and II were both locally produced at Marki, with the same raw materials. However fabric VI, processed less thoroughly, was used for larger artefacts such as hobs and loomweights, and some coarse varieties of RP, such as large closed vessels and pans. Fabric II, which was more thoroughly processed, or the raw materials for its production more carefully selected, was used for a variety of RP pottery types, including bowls, and small and large closed vessels, some which even carry incised decoration (RP-11359 and RP-12361). Fabric II was also used for pans (RP-7173 and RP-7464) and mealing bins (CW-9207). If the chronological distribution of the Marki fabrics is accepted to be accurate, then fabric II, which also was used for some Philia fabrics, and potentially fabric VI also, are locally produced at Marki from its earliest strata and throughout its lifespan, and characterise local production of utilitarian pottery at the settlement.

While it was argued that fabric III is very similar to fabric II, nevertheless it cannot be argued with confidence that this was also locally produced at Marki, and not imported from another settlement in the broader geological region to which Marki belongs. Fabric III is composed only by Philia samples, including 4 RPP and 6 PRS vessels. Chemically, fabric III is very uniform represented by a relatively tight cluster, certainly tighter than those representing fabrics II and VI (**Figure IV.50**). The partial chemical overlap between the fabric II and III clusters (**Figure IV.50**) in association with the mineralogical similarities between the two fabrics could be used as indications for the local character of this fabric, but they are not adequate to argue this with confidence. The production of coarser PRS pottery with fabric III should be not used as an indication for local production, as PRS was also found to be made with other fabrics, including I, IV and many of the outliers.

Fabric I was extensively discussed in Chapter III. As the analyses on RPP pottery made with fabric I from different sites has shown, this fabric was widely distributed across Cyprus during the Philia phase, and it was reaching Marki from somewhere in the north, probably either the north coast or the Ovgos valley, via a well-established network of pottery circulation. The physicochemical study of PRS and WPP pottery has indicated that fabric I was not exclusively used for the production of RPP pottery and that PRS and WPP, made with fabric I, were also imported to Marki.

Another fabric used for the production of a broad range of ceramic types is fabric IV. It is used for RPP, PRS, WPP and RP vessels, three mealing bins, a pithos, RPC and RPCP. The pottery made with this fabric can be divided into fine and coarse pottery. Fine pottery includes carefully made RPP, WPP and RP vessels, while coarse pottery includes the mealing bins, pithos and cooking pots. This is a fabric that was clearly used for the production of a large and diverse range of ceramic types from the Philia phase until MC period.

Fabric IV is a relatively distinct, micaceous fabric, the mineralogical composition of which can be associated with the broader Troodos geological zone, and therefore cannot be used for pinpointing vessel provenance. However, mealing bins, in particular, are fixed features on lime plaster settings in the settlement (Frankel and Webb 2006a, 7, 11, 24), which, like hobs, are considered to have been constructed in situ. Therefore, the range of coarse pottery made with fabric IV, including the three mealing bins, the two PRS, the six cooking pots and one pithos, suggests that fabric IV was locally produced at Marki primarily associated with utilitarian pottery, used for everyday domestic activities. From a chronological point of view, this is a fabric that was used mainly in the earliest occupational phases of the settlement, and after an overlap with fabric VIII, its production was probably reduced, as it was largely replaced by the latter.

What makes the interpretation of the data related to fabric IV more complicated is the fact that among the vessels made with fabric IV, three belong to a discrete type of early RP with a medium lustre and distinct mottling (**Figure IV.98.a-c**), which are in sharp contrast with the coarser ceramic types included in this fabric. The three early RP bowls are perhaps the most finely and most carefully produced vessels belonging to the EC I-II chronological spectrum recovered at Marki, and present close typological similarities with vessels coming from Psematismenos and

Maroni (Frankel and Webb 2010, 106). Moreover, there is a WPP vessel and a RPP vessel made with fabric IV, from Nicosia *Ayia Paraskevi*. The overall small number of WPP recovered at Marki is suggestive of their import to the settlement, while the RPP vessel from *Ayia Paraskevi* cannot be associated in any way with the local ceramic production at Marki; as has already been argued in the preceding chapter, Marki throughout the Philia phase – and most probably throughout the settlement's lifespan – retained the role of a recipient in the various networks of ceramic exchange with other communities.

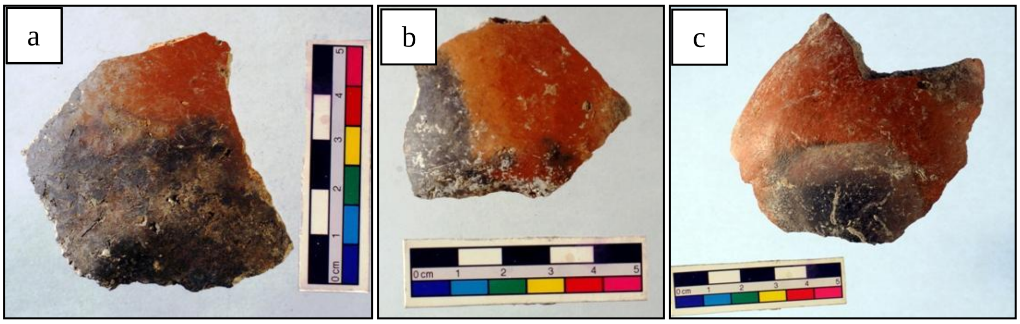


Figure IV.98. RP Mottled samples made with fabric IV. RP-15646 (**a**) and RP-16541 (**b**) and RP-10242 (**c**).

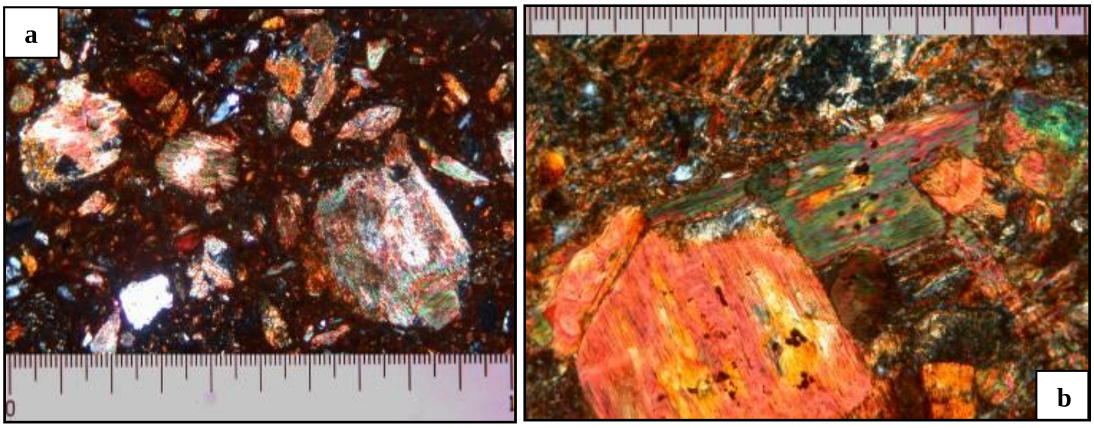


Figure IV.99. A biotite mica-rich fabric is found in different sites across the Troodos circumference. **a.** RP sample from Kalavasos *Cinema Area* (tomb 757 sample no. 7/90) and **b.** RP Sotira *Kaminoudhia* (area A, sample no. 25/90). Both photomicrographs should be compared with **Figures III.35-III.36** and **IV.21-IV.23** (XP, full scale: 1mm).

Considering the close typological affinities among the early RP-Mottled vessels from Marki with other central and southern sites and the existence of the WPP and RPP vessel from *Ayia Paraskevi* made with fabric IV, it is inevitably concluded that this fabric was widely produced across the south-central region, where clays rich in biotite mica are frequently found. This distinctively rich in biotite mica fabric is also recorded among RP samples collected from Kalavasos, Episkopi and Sotira (**Figure IV.99.a-b**, Barlow and Vaughan 1996), all of which are located in the same broad geological region around the Troodos and have access to similar materials (**Figures I.1** and **IV.53**). According to Vaughan (1996)[38],

> "this igneous fabric is very distinctive petrographically, composed almost entirely of angular to subrounded rock fragments and their dissociated constituents, derived from the Pyroxenite and Uralite Gabbro members of the plutonic complex of the Troodos ophiolites. […] The relative coarse grainsize of the consituents of this fabric, and the homogeneity of the material profile suggest the use of a primary clay […]. The clays appear to have been prepared by the potter using a minimum of mechanical refining, and the grainsize range of the rock fragments suggests the clay was not sieved or levigated".

Vaughan's references match well the description of fabric IV, in support of the general argument that different production centres in the region shared common technological practices in pottery production. As **Figure III.53** shows (see also geological map of Cyprus in Constantinou 2002) the plutonic complex of the Troodos ophiolites, (plagiogranites, gabbros, pyroxenites, wehrlites and dunites) covers much of the south-central region of the island explaining the production of this distinctive fabric at different settlements of the region.

It seems that EC-MC settlements located around the Troodos' fringe could be using similar raw materials not only because they shared common ceramic traditions but primarily because they had access to similar resources. While it seems that many of the vessels made with fabric IV, especially WPP, could be imports to the settlement from production centres located in the broader south-central region, others including the coarser Philia and EC-MC ceramic types were locally produced at Marki, as the mealing bins made with fabric IV suggest. A local character could also be assigned to the RP-Mottled pottery, as according to the excavators, much of the material in Marki immediate post-Philia levels, belongs to this RP sub-variety (Frankel and Webb 2006, 105). This argument is particularly important as it defines the broad chronological spectrum within which fabric IV is produced, representing perhaps a significant part of the local ceramic production at Marki, used for the production of both fine and

[38] Unpublished report presenting the results of a preliminary petrographic analysis of 39 RP samples from six regional sites, including Nicosia *Ayia Paraskevi,* Alambra Mouttes, Kalavasos *Cinema Area* and *Panayia Church,* Episkopi *Phaneromeni* and Sotira *Kaminoudhia.* The unpublished reports, thin sections of samples and other related material were examined through the courtesy of Dr S. Vaughan and Dr J. Barlow.

coarser pottery from the Philia until the MC period. Moreover, it implies that this significant proportion of local production at Marki formed part of a broader regional ceramic tradition that gradually became stronger in EC, characterising much of the central and southern region.

Fabric V is used exclusively for the production of Philia cooking pots of Type a, which is believed to be imported to Marki from elsewhere during the Philia phase. As has already been argued, fabric V is a very homogeneous group, in which the micritic limestone fragments are evenly distributed across the clay matrices, following a specific size mode. Some metamorphic inclusions in the form of chert, quartzite and quartzite-schist fragments are also found, while the presence of igneous components is restricted to a few plagioclase feldspars (**Figures IV.9** and **IV.10**). This is a fabric which is evidently imported to the settlement, as its mineralogical characteristics do not match those of the surrounding geology. In addition, the technique of tempering was not applied in the production of any of the other fabrics recorded at Marki.

If fabric V was used exclusively for the production of Philia cooking pots of Type a, fabric IV was its contemporary equivalent for the production of cooking pots of Type b. Most of the cooking pots made with fabric IV are dated to phases A to D, and only one (RPC-12940) is dated to phase F but it could be residual in the phase F context from an earlier period. Therefore, fabric IV could be Marki's local (and/or regional) alternative to imported cooking pots during the Philia and EC periods.

In EC I-II, after the break-down of the island-wide Philia network of interaction and material exchange, reflected in the distribution of fabrics I and potentially cooking pot fabric V, Marki turned towards its immediate regional environment, participating in a more restricted network of contacts within the central-south region, reflected in the distribution of fabric IV used for both fine RP pottery and cooking pots.

From EC I-II, it seems that the production and use of fabric IV overlaps with that of fabric VIII, which becomes the principal fabric for the production of cooking pots and other RP shapes from EC III onward. Similarly to fabric IV, fabric VIII consists of igneous materials, which characterise the broader region surrounding Marki. However, fabric VIII is primarily characterised by a higher occurrence of monocrystalline and polycrystalline quartz and metaquartz than fabric IV, a lower density in biotite mica and a low degree of metamorphism, reflected in the presence of metaquartz, which is not so evident in fabric IV (**Figure IV.2** contra **Figure IV.25**).

This preference for clays richer in quartzitic inclusions than micas indicates a technological change in the production of RP/RPC fabrics at Marki, which occurs in EC I-II and becomes progressively a strong characteristic of local pottery tradition in EC III.

Fabric VII is one of the most diverse and difficult to interpret groups identified in terms of typological variation. It is composed of three samples, one finely incised RP large closed vessel (RP-4864), a small, highly-lustrous RP black-topped bowl (RP-12359) and a large open ERS bowl. The fineness of fabric VII, the finely executed incised decoration on RP-4864 and the highly lustrous slip of RP-12359 indicate that these vessels were used in different contexts of domestic activity from the coarser vessels made with fabrics II, IV, VI and VIII. While the latter could be used for the preparation of food and other utilitarian tasks, the vessels made with fabric VII were used as tableware, and that is why they were more finely executed, with more effort invested in their elaborate production. There is no indication available to argue whether these three vessels were made locally or were imported to Marki, primarily due to their undiagnostic mineralogy.

However, considering the types of pottery included in fabric VII, it seems likely that they were imported to Marki from elsewhere on the island. The mineralogical and chemical similarities between the incised RP-4864 and ERS-6416 are especially interesting (these two samples form a tight cluster), as they suggest a common origin for these different types of fine ware. Moreover, the use of fabric VII for the production of RP-4864, which is considered to belong to early RP I-II, with ERS-6416, reinforces Frankel's and Webb's argument that ERS pottery at Marki is somewhat earlier than the bulk of known EC III ERS pottery from Lapithos and Ayios Iakovos (Frankel and Webb 2006a, 141).

On the other hand, RP-12359 is chemically different from RP-4864 and ERS-6416. This chemical diversity between samples allocated to the same fabric, suggests that different production centres were using similar fabric recipes to produce RP incised and black-topped, and ERS pottery types, using thoroughly processed, calcareous clays, with few inclusions to be used as mineralogical discriminators.

The raw materials for the production of fabrics IX and X are believed to have a common origin, from the same geological environment, and are also two comparable chemically (**Figure IV.50**). It is not clear whether vessels in these two fabrics were locally made at Marki, or imported from another settlement; nonetheless both fabrics characterise the later periods of the settlement from EC III to MC I/II (**Table IV.7**) and are used exclusively for the production of RP bowls of medium to hard scale in hardness with incurved thinning rounded rims. Even though the provenance of these fabrics is unclear, it can be argued that they belong in that broader category of igneous fabrics that define the Troodos region surrounding Marki, and therefore characterise, if not the local, then the regional production of pottery.

Fabric XI is distinctively different from all the other recorded fabrics due to the unprecedented presence of dolerites in its mineralogical composition. Therefore, it is unlikely that this fabric was locally made at Marki, due to its differing mineralogy in relation to the bulk of the analysed samples. It is argued that fabric XI could be reaching Marki from another production centre located in the central-southern region around the Troodos massif.

Fabrics XII and XIII are the finest fabrics recorded within the Marki sample, both characterised by the rarity of rock and mineral inclusions. Even though the absence of any discriminating petrology prevents any associations between these fabrics and specific geological regions, it is argued that vessels in both fabrics were imports to Marki from EC III onwards. Fabric XII is exclusively used in the Marki sample for the production of fine juglets, bowls and large closed vessels that belong to the RP incised and black-topped repertoires. Fabric XIII is exclusively used for the production of ERS pottery.

ERS is found in small quantities at Marki. This is a ware that is technologically differentiated from pottery thought to be locally made at the settlement in terms of the fabric fineness, thin walls, and thin and matt slips, which seem to be brushed across their surfaces rather than polished (see also Frankel and Webb 2006, 141). ERS pottery is found in larger quantities in the eastern part of the island, from where it was probably reaching Marki (Frankel and Webb 2006, 141).

Three of the samples of fabric XII are RP I/II kick-ups from earlier periods, while all the rest fall within the wider group of RP III, broadly used across Cyprus between the EC III and MC II periods. The chemical inconsistency observed within this fabric suggests that these vessels could be the products of different workshops using similar raw materials and techniques for the production of incised pottery, rather than the products of a single production centre. This suggestion is supported typologically and chronologically, as well as technologically. Fabric XII is important in demonstrating the selective use of calcareous, well-refined clays for the production of incised vessels with highly burnished slips, both in the EC I–II period and, in particular, during EC III– MC II. Moreover, from a methodological point of view fabric XII, just like fabric VII, is significant in demonstrating the importance of a combination of analytical techniques especially for the study of fine fabrics without any discriminating petrology.

In addition to the typological variation within each fabric, and the overall observations related to the chronological range of each fabric, fabric variability is assessed below within each of the two main pottery classes under investigation, namely RP and RPC/RPCP, as well as within the overall Philia assemblage. The three Philia wares, RPP, PRS and WPP from Marki are studied together in order to complete the picture of ceramic production during the Philia phase, which was initiated in Chapter III.

IV.3. a. The Philia pottery

The combined microscopic study of the three Philia wares was conducted with several questions in mind. A central aim of the project was to examine how this morphological homogeneity in the RPP assemblage can be interpreted compositionally, and if RPP ware was indeed manufactured locally at Marki, or if it was only imported from other settlements. Did many potters adapt to a common "fashion" and consequently to a common ceramic recipe? Or was this pronounced "standardisation" in RPP an outcome of a centralised, specialised craft? Did PRS and RPP indeed belong to two different contexts of production and how can this argument be justified from a technological point of view? Were the slipped and unslipped versions of WPP associated with different production centres or were they produced in the same production centre? And to which extent do these wares share similar, technological features?

As has been argued in Chapter III, RPP pottery from Marki is made with at least four different fabrics, while the outliers suggest that additional fabrics were also used for the production of this ware (**Table III.4**). More than half (51%) of the RPP sample from Marki is made with fabric I, which is believed to be imported to the settlement from the north-west, either the Ovgos valley, or Vasilia on the north coast. Another significant proportion of RPP pottery from Marki, representing 21%, is made with fabric II, while 10% is made with fabric III. A smaller percentage, representing 8% of the entire RPP sample from Marki is made with fabric IV, while the remaining

10% is made with other unclassified fabrics (**Table III.4**). This variability in RPP fabrics suggests multicentric production of RPP pottery, which was reaching Marki from more than one centre, at various levels of interaction, both at a regional level and on a broader, island-wide basis of interaction.

Table IV.9 shows that the same fabrics used for the production of RPP pottery were also used for the production of PRS and WPP pottery, and that all defined fabrics, including notably fabric I, were variably used for the production of these wares. According to Frankel and Webb (2006a, 101), given the overall small number of WPP vessels (WPP vessels at Marki constitute less than 0.4% of all identified Philia ceramics), this ware is likely to have been imported to Marki. **Table III.9** shows that WPP samples were recorded to be made with fabrics I, II and IV. Four more WPP samples were identified as outliers and add to the overall fabric variability within this ware. None of the WPP samples under study was found to be made with fabric III.

Fabric	Ware	No. of samples	Ware%
I. FINE MICRITIC LIMESTONE RICH FABRIC WITH FEW FRAGMENTS OF CHERT AND TCFS	PRS	1	1.5%
	RPP	20	31%
	WPP	3	5%
II. COARSE IGNEOUS FABRIC WITH SOME CALCIFEROUS MATERIAL	PRS	1	1.5%
	RPP	8	12%
	WPP	1	1.5%
III. COARSE IGNEOUS FABRIC WITH SOME MICRITIC LIMESTONE FRAGMENTS AND MICROFOSSILS, AND FREQUENT PRESENCE OF ACFS	PRS	6	9%
	RPP	4	6%
	WPP	-	-
IV. COARSE BIOTITE MICA RICH FABRIC WITH VARIOUS IGNEOUS INCLUSIONS	PRS	2	3%
	RPP	4	6%
	WPP	1	1.5%
REDUCED IGNEOUS SPECIMENS	PRS	3	5%
	RPP	-	-
	WPP	-	-

Table IV.9. Typological variation within each of the four fabrics used during the Philia phase.

This relatively large fabric variability within such a small ware assemblage is especially interesting. It shows that there was not a specific channel for WPP distribution towards Marki, but rather that this ware, even if at very small numbers, was imported to Marki from different production centres and along with RPP vessels. The general impression given is that small quantities of WPP pottery were manufactured at different production centres in parallel with RPP vessels. This argument is strengthened by macroscopic observations regarding the limited range of shapes, some of which are closely paralleled in RPP, as well as the soft fabrics, which in general follow the pattern established for RPP (Frankel and Webb 2006a, 102).

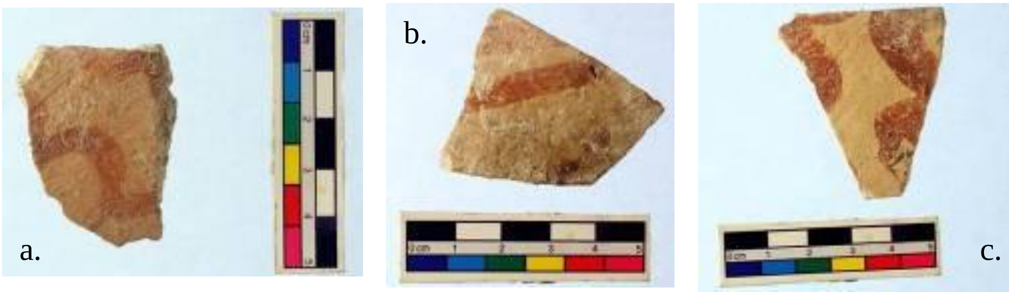


Figure IV.100. The WPP sample from Marki includes both the unslipped [MA-7761 (**a**) and MA-13529 (**b**)] and slipped [MA-16234 (**c**)] varieties.

As has been mentioned, there are two sub-varieties, the slipped and the unslipped, recorded within the WPP assemblage from Marki (see also Frankel and Webb 2006a, 103; **Figure IV.100**). WPP samples from both sub-varieties were analysed using petrography. Overall, the WPP samples all have thin walls and they are made with fine fabrics without any significant presence of visible inclusions. The paint used for the decoration of these vessels seems to be made in a similar fashion, as it has basically the same chroma on both the slipped and unslipped varieties (**Figure IV.100**). In most cases the WPP fabrics look similar to the RPP ones (see also Frankel and Webb 2006a, 101-103).

The WPP sample is definitely too small to allow any well-founded arguments about specific patterns followed by each of the production centres. Nonetheless, current analyses give the impression that each production centre was following and producing a specific variety of WPP. For example, it seems that the production centre or centres producing WPP of fabric I, did not apply any slip on the external surfaces of the pots, including large and closed vessels (WPP MA-7709), large open shapes (WPP MA-13529) and small bowls (WPP MA-15242). On the other hand, WPP samples made with other fabrics have either one or both their surfaces slipped.

If there is indeed a patterned relation between the presence or absence of slip on the exterior and/or interior surfaces of WPP vessels and WPP fabrics, this will be one of the few patterns differentiating the various production centres, and perhaps indicating some varying technical and stylistic inclinations among workshops. Even so, it is interesting to notice that different sub-varieties coexist at Marki, suggesting that even if there was some technological or regional differentiation in the production of WPP, different production centres were participating in the ceramic exchange network, and Marki was importing WPP from more than one production centre.

Figure IV.101. Typological variability is observed between the PRS samples from Marki. PRS samples MA-7471 (**a**), MA-14323 (**b**), and MA-16477 (**c**), all belong to large closed shapes, but their bases' shape and thickness vary significantly.

Examples of PRS ware are compositionally the most diverse group of samples, also, reflecting the morphological variability characterising them (**Figure IV.101**). Of sixteen PRS samples analysed. 38% are made with fabric III (**Tables III.9**), while three samples were found to be reduced fired under the microscope (**Figures IV.43** and **IV.44**) and could not be categorised in any of the fabrics, nor as outliers. However, some basalt and dolerite fragments, as well as some carbonates visible in thin section, suggest some similarities with fabric III. If these three specimens were not made with fabric III, they were made with raw materials collected within the wider Troodos south-central region.

Only one sample (PRS MA-9121) was made with fabric I, another one (PRS MA-10234) with fabric II, two (PRS MA-7471 and PRS MA-9173) were made with fabric IV, and the final three samples (PRS MA-14280, PRS MA-15277 and PRS MA-16477) were classified as outliers since they did not present any compositional similarities among them or with any of the other analysed samples. This significant degree of fabric variability within such a small number of PRS samples raises a range of questions regarding the context of their production and their distribution, not only at Marki, but between different sites.

PRS pottery differs greatly both technologically and stylistically from the other two contemporary wares under study, namely RPP and WPP. The "cruder" manufacture and coarser clays linked with the more "idiosyncratic" PRS forms have led Frankel and Webb to argue that PRS most probably represents a different context of production from that of RPP, and that PRS and RPP vessels were not made by the same potters (Frankel and Webb 2006a, 90). Specifically it was suggested that

> "the higher quality ceramics were reaching Marki from one or more, larger settlements located elsewhere, while the poorer quality vessels were made locally by less experienced potters to supplement the supply of imported pots and provide vessels for particular production activities" (Frankel and Webb 2006a, 90-91).

Frankel and Webb conclude that

> "if PRS was made locally, however, a lower incidence at some sites might also imply that these were RPP production centres, less dependent on poorer quality vessels" (Frankel and Webb 2006a, 91).

Even though most of the PRS vessel types are paralleled at other contemporary sites (Frankel and Webb 2006a, 99), there is a number of PRS vessel types at Marki which are not yet known from other sites. This is mainly due to the exceptionality of the settlement, currently being the most extensively excavated EC-MC settlement site, and consequently presenting the broadest range of ceramics. These exclusive PRS types at Marki include deep flat-based vats, braziers and baking pans (Frankel and Webb 2006a, 91).

Considering the small number of PRS samples, in comparison, for example, with the 39 RPP samples, PRS ware shows the greatest fabric variability among the three Philia wares under study. Such a high degree of fabric variability could be the result of different factors, involving the production of this ware at different production loci and its distribution to Marki from different centres. Moreover, the fabric variability observed within the PRS sample could be underpinned by the absence of standard techniques in its production.

Simply by looking at complete PRS vessels (Frankel and Webb 2006a, Text Figure. 4.10, 98 and Plate 49) and comparing them to other contemporary pottery, the first impression formed is that the former were made by less-experienced craftsmen. The thick walls, distorted angles, misshapen vertical sections, untreated rims and bases, and uneven, coarse surfaces challenge any assumption that these pots and the finer RPP and WPP vessels were made by the same craftspeople. However, the production of PRS pottery with fabrics used also for the production of the carefully manufactured and elaborately decorated RPP and WPP pottery, including the widely distributed fabric I, is noteworthy, and makes one wonder why pottery made by less-experienced potters would become an object of exchange or distribution between different settlements.

PRS seems to be imported to Marki, as PRS samples were recorded to be made with fabrics I and IV, which, as has been argued are imported to Marki from northern and central-southern sites respectively, while some PRS samples were also classified as outliers. The import of PRS from other centres could explain well the similarities observed between some PRS specimens found at Marki with PRS pottery recovered at other sites (Frankel and Webb 2006a, 99). On the other hand, those shapes exclusively found at Marki, such as vats PRS-16532 made with fabric III or PRS-16466 made with the reduced fired fabric, suggest that they could be local products at the settlement, or perhaps these shapes are only known from Marki because this is the only excavated settlement dated to the Philia phase, and PRS, primarily associated with food processing, was not frequently deposited in tombs.

In any case the relatively large range of PRS fabrics suggests that this is a ware that is produced at different locales. The general impression is that less attention was intentionally given to the production of this type of pottery possibly because it represents a utilitarian type used in domestic activities, and that within the uniform Philia culture, PRS was at different centres produced following island-wide conventions that allowed this type of pottery to be coarse and simply finished.

IV.3.b. Red Polished pottery.

RP ware is the most prominent type of pottery during the EC and MC Bronze Age, whose widespread production and circulation across Cyprus extended over half a millennium (ca. 2400-1700 BC). Its extensive lifespan finds its counterpart in the many scholarly attempts to classify this ware according to its macroscopic attributes. As has already been discussed in Chapter I, the first classificatory systems were heavily based on the great range of shapes, decorative techniques and motifs exhibited by this ceramic type (e.g. Myres 1899; Gjerstad 1926; Stewart 1962).

These early studies were followed by publications generated in the 1980s and 1990s, following excavations of settlement sites and the recovery of ceramic material coming from securely stratified, domestic contexts, which produced new data that could be used for the better understanding of chronological and regional variations (e.g. Bolger 1983; 1985; 1986b; Barlow and Idziak 1989; Barlow, Bolger and Kling 1991; Webb 1994; Barlow 1996c; Barlow and Vaughan 1992; Frankel and Webb 1996; Barlow and Vaughan 1999). Moreover, some early analytical studies (e.g. Courtois 1970; Frankel *et al*. 1976; Jones 1986; Knapp and Cherry 1994; Barlow and Idziak 1989; Summerhayes *et al.* 1996; Barlow and Vaughan 1999) began to address additional questions about the Early and Middle Bronze Age modes of ceramic production, degrees of standardisation, as well as the patterns of pottery circulation, and related forms of social interaction.

RP is the most abundant class of pottery in the EC and MC Bronze Age archaeological record (e.g. RP ceramics constitute 99% of the overall assemblage at Alambra and over 90% at Marki; Coleman *et al.* 1996; Frankel and Webb 1996). Its long lifespan across Cyprus, together with its handbuilt nature, resulted in a great variation of shapes, surface finishes, decorative techniques and motifs, which constitute a significant corpus of information related to EC and MC ceramic typology, style, and technology, corresponding to a range of shapes, surface treatment and decorative techniques, and fabrics used for its production. This great variability within the ware prompted Barlow to term RP the *bête noir* of archaeologists studying the Early and Middle Cypriot Bronze Age (Barlow 1989).

An analytical study of ceramic samples from Marki by electron microprobe was conducted by G. R. Summerhayes (Summerhayes *et al*. 1996). Both his analytical work and the study on RP pottery from different sites conducted by Barlow and her collaborators (Barlow and Idziak 1989; Barlow and Vaughan 1999) focused on dividing the sample into calcareous and non-calcareous fabrics, and the technological factors that might have encouraged the systematic use of the one or the other type of fabrics. Both studies argued that most of the RP pottery was locally made at each of the sites under study, with some minor inter-site imports. The project reported here expands on previous studies by incorporating a much larger sample and covering a diachronic sequence, as well as by employing both chemical and petrographic data.

RP pottery represents 39% of the analysed Marki sample (72 of the 185 samples, **Figure IV.1**). Almost all identified EC-MC fabrics (fabrics II, IV, VI-XII;

Figure IV.97) were used for the production of RP pottery, with the exception of fabric XIII, which was exclusively used, at least in the Marki sample, for the production of ERS pottery.

In general terms, the petrographic study of fabrics II, IV, VI and VIII does not indicate any detailed processing of the clays before the building of the pots. The size and distribution of the inclusions, for example, is analogous to those of the soil samples. Furthermore, the presence of clay striations in soil sample 2 indicates the natural mixing of clays, as part of the alluvial blend. Therefore, similar evidence found in the samples of fabrics II and VI may be regarded as the result of natural processes rather than artificial mixing of different clays.

Fabrics VII, IX, X, XI and XII seem to be finer in texture than the aforementioned fabrics, and are characterised by a smaller number of inclusions. Looking at **Table IV.7**, it is evident that these finer fabrics are dated to the later periods of the settlement, to the EC III period and even later. The only exception could be fabric XI, as one of the samples made with this fabric is dated to phase B (Philia period). Overall, it seems that from the EC III period onwards some attempts were made at employing finer clays in pottery making or/and at more thorough processing of RP fabrics, for both calcareous and non-calcareous fabrics.

Fabric X is very interesting from a technological perspective, but also with respect to the chronology and evolution of the RP production during the EC III and MC I-II periods. This fabric is linked, in the Marki sample, with the production of RP bowls, all of which are very similar mineralogically, chemically, and typologically.

From the nine vessels composing fabric X (**Table IV.4**), six vessels are very similar in shape, rim diameter and wall thickness: RP-5770, RP-7208, RP-7301, RP-11341, RP-12933 and RP-14204 (**Appendix IV.2**). They are all small in size, have a similar incurved, thinning, rounded rim, their rim diameters range between 100 and 200 millimetres and their body’s wall thickness between 5 and 6 millimetres. Moreover, **Figure IV.51** shows that the samples belonging to fabric X create a rather close chemical cluster. Mineralogically, fabric X has a moderately fine groundmass, enriched with some small fragments of micritic limestone, pyroxenes, and biotite mica. Among all the RP typological and fabric sub-varieties, this group of RP small bowls is distinguished for its typological and compositional consistency, suggesting some degree of standardisation in their production in terms of fabric and typology.

The samples of fabric X come from the latest phases of the settlement, from Phases F to I, indicating some inclination towards technological standardisation from EC III onwards. The compositional and typological consistency that characterises this fabric suggests that either these bowls are imports from another production centre, or that these bowls were made at Marki by potters systematically using the same raw materials, fabric recipe and techniques of vessel building.

The other large RP compositional group worth considering is fabric XII. In contrast to fabric X, which is very homogeneous both compositionally and morphologically, fabric XII could be characterised as a heterogeneous group encompassing chemically and stylistically different vessels. What unites all these vessels into one group is the systematic use of calcareous, well-processed, or carefully selected, clays for their production.

Fabric XII is the finest among the analysed Marki fabrics. Its main characteristic is the nearly total absence of rock and mineral inclusions, which when rarely found are very small in size, and double- to open-spaced. Besides the absence of inclusions, all of these ceramics are characterised by the softness of the pastes (hardness ranges from 1 to 2 on Moh's scale) and the presence of incised decoration. Furthermore, almost all of the vessels are small and closed in shape.

It is not a coincidence that six from the seven samples composing fabric XII carry incised decoration, since the soft, plastic calcareous clays with minimum inclusions are the most suitable for incised decoration. While it was clear after the completion of the ED-XRF analysis and the statistical manipulation of the elemental dataset that fabric XII consists of technologically similar but compositionally dissimilar vessels, it was thought apposite to keep the existing mineralogical group as defined by petrography, and not split it into numerous outlier samples, in order to emphasise their technological similarity, reflected in the use of very similar, fine, micritic clays for the production of these incised RP vessels, which are however chemically shown to have been collected from different raw material resources, and possibly produced by different workshops.

An island-wide convention seems to exist in the use of thoroughly processed, or naturally fine, inclusion-free clays for the production of RP incised pottery. The selective use of these fine calcareous clays is evidently associated with the physical properties of the resulting fabric, the plasticity and fineness of which facilitate the execution of elaborate incised motifs. The presence of early RP-3609 in fabric XII suggests that this ceramic tradition has its roots in EC I and evolved further and became more widespread for the production of EC III RP III incised pots. In fact, highly calcareous fabrics for the production of incised decoration were first recorded during the Philia phase, on RPP pottery. It can be argued that this was a longstanding tradition, which never essentially ceased to exist and which evolved from incised RPP to early RP, and then to the heavily incised RP III.

Taking into consideration the entire sample of finely incised RP vessels from Marki, these are made with many differing fabrics. In addition to the four incised RP made with fabric XII (**Figure IV.102.a-d**), one finely incised jug, RP-4864, is made with fabric VII, while another elaborately incised bowl, RP-12372, is classified as an outlier, presenting no compositional similarities with any of the recorded fabrics. This fabric variability suggests that incised decoration was reaching Marki from more than one production centre. One of these centres was located on the north coast as the decorative motifs present on RP III gourd juglet 7256 suggest (Webb pers. comm.).

Figure IV.102. RP incised pottery made with fabric XII. **a.** RP-3265, **b.** RP-3305, **c.** RP-7256, **d.** RP-14053.

Within fabric XII, the technological characteristics of the incised decoration reinforce the argument that the vessels made with this conventional fabric come from different production centres, which used common techniques in the selection of raw materials and their processing for the production of incised RP pottery. The incised motifs on RP-3265, RP-3305, RP-7256 and RP-14053, all made with fabric XII, indicate that the corresponding vessels belong to the wider RP III tradition, which flourished from the EC III period onwards. However, the execution of incised decoration on these vessels differs from vessel to vessel. While the decorative motifs on RP-7256 and RP-14053 seem to be similar and form linked concentric circles, the incisions on RP-14053 are very shallow and the incisions on RP-7256 are deeper and filled with lime, indications that these two vessels were incised using different techniques (**Figure IV.102.c-d**). In the same way, the white filling in the incisions of RP-3265 is well preserved, while there is little to no indication that any lime was used for filling the incisions of RP-3305, where the points of tool insertion are identified as the rounded and deeper areas at the beginning of lines (Frankel and Webb 2006); an observation which was not recorded for RP-3265, on which the incisions have the most regular, fine margins (**Figure IV.102.a-b**).

In addition to the widespread practice of using calcareous, well-refined clays for the production of elaborately incised RP pottery, incised RP made with coarser, less calcareous clays was also recorded. The execution of incised decoration on vessels RP-11359, RP-12361 and RP-15481 (**Figure IV.103.a-b**) seems to belong to a different ceramic tradition than the one used for the production of the other incised RP pottery included in the Marki sample.

Figure IV.103. a. RP-15481 and **b.** RP-12361.RP samples with incised decoration from Marki.

The coarser execution of the incised motifs on these samples is primarily related to the fabrics with which the corresponding vessels were made. RP-11359 and RP-12361 are made with fabric II and RP-15481 with fabric IX. Fabric II is coarse in texture and contains igneous inclusions which could operate as obstacles and inhibit the smooth and uninterrupted forming of the incised motifs. The igneous nature of both fabrics and the production of RP-11359 and RP-12361 with other utilitarian shapes in fabric II, in particular the two pans and the mealing bin, could indicate the local character of this fabric, and consequently this type of incised RP pottery at Marki.

RP black-topped samples are all made with a fine fabric, very similar to that used for RP incised pottery. The mineralogical and chemical variability among the RP black-topped samples (most of them were classified as outliers during the petrographic study, one found to be made with fabric VII and another one with fabric XII) indicates their import to Marki from various production centres. This sub-variety of RP is believed to have been produced mainly in northern and central centres (Frankel and Webb 2006a, 139), indicating that contacts with these regions were in place in EC III.

The fineness of pottery imported to the settlement (i.e. RP made with fabrics VII and XII, and ERS made with fabrics VII and XIII), in contrast to the coarseness of the bulk of those fabrics that could be considered as probably local products (i.e. RP and RPC made with fabrics II, VI and VIII), indicates that fine pottery was not produced at Marki, but was imported from other production centres. Overall, it seems that the Marki potters produced utilitarian pottery for the everyday domestic needs of the settlement, while the finer vessels were imported from various production centres located in the broader central-south region or even further away on the north coast.

It seems that EC-MC RP pottery production operated at different levels, one level characterising production aiming at serving the local needs of the community in which it operated, with little attention to detail and requiring less skill, while at a second level, in addition to the coarser utilitarian shapes, finer pottery was produced with more attention given to surface treatment and vessel decoration. It is not possible to argue at present how these higher quality vessels were imported to Marki, and what types of social and economic systems sustained interactions between smaller and larger communities, but their recovery at Marki at least suggests that the settlement throughout its lifespan was in constant contact with other settlements, located in the surrounding region, but also further away on the north coast. Some first observations on whether and how Marki’s social relations altered during the Philia, EC and MC periods are considered in the final section of this chapter.

IV.3.c. Cooking pots

Thirty-two cooking pot samples were analysed from the Marki diagnostic assemblage. Both identified Philia cooking pot types (RPCP) were included in the cooking pot sample, with samples collected primarily from phases A to B. It was easier to identify and collect RPCP sherds, which formed part of Philia Type a cooking pots, due to the presence of small white and other grey inclusions evenly distributed through their section. These include RPCP-7437, RPCP-10210, RPCP-10212, RPCP-13140, RPC-15301, RPCP-15303 (**Appendices IV.1** and **IV.2**). These examples have a horizontal mouth with an everted thinning rim. There is no evidence for slip application on their surfaces and they are of a medium to hard scale in hardness.

Some Philia cooking pots of Type b were also included in the RPC sample; being contemporary to Philia cooking pot Type a, they also come from phases A and B. These samples include RPCP-13016, RPCP-15163, RPCP-15305 and RPCP-15640. Two of them (RPCP-15163 and RPCP-15305) are parts of flat bases, and the rest form parts of the characteristic flaring thinning rim of Philia RPC Type b. All of them seem to be made with the same medium to coarse texture fabric, with white and black inclusions and have a matt to slight lustre.

The EC-MC RPC samples coming from periods C to I belong to different types of cooking pots. All the RPC samples from the later phases of occupation seem to be made with the same medium to coarse fabric, with some white and black inclusions, of a medium to hard grade in hardness. When a slip layer can be identified on the vessels' surfaces, this is always thin, and often with a matt lustre.

From a macroscopic point of view, it seems that there is less typological and fabric variability among the RPC samples than within the RP assemblage. The general impression given is that three fabrics were in use for the production of RPC vessels throughout the lifespan of the settlement. This is in sharp contrast with the variety of fabric, types, styles and surface treatments that are observed within the RP sample.

The cooking pot samples were exclusively allocated to three different fabrics, IV, V and VIII. This observation alone indicates that not all fabrics were considered appropriate for cooking pot manufacture, but that specific fabrics were systematically used for the production of cooking pots, and that their successful production and, most importantly, effective use, were subject to the technological choices made by their makers. Most of the cooking pot samples (77%) are made with a non-calcareous fabric, rich in igneous inclusions and in particular biotite and monocrystalline and polycrystalline quartz and metaquartz. However, seven samples (the remaining 23%) are made with a calcareous fabric, characterised by the predominant presence of micritic limestone fragments, which are thought to be artificially added to the fabric by the potters.

This is a very interesting observation, as cross-culturally, limestone or monocrystalline calcite are more commonly used in non-cooking pot fabrics (Shoval *et al.* 1993, 263, 271; Arnold 1985). As has already been explained the presence of limestone, and more broadly carbonate tempers in ceramic fabrics, is a source of functional disadvantage due to their thermal decomposition, which in its turn causes the formation of defects and porosity in the pots (Shoval *et al.* 1993, 269). Why then did the Philia potters use this relatively unsuitable temper material for cooking pot fabric Type a, and how did they manage to produce limestone enriched cooking pots that survived not only initial firing as part of their production sequence, but also repeated heating in later household activities?

It has been argued that limestone temper, like shell temper, was deliberately chosen on many occasions in antiquity because of the resulting reduced bulk thermal expansion of the pot's body (Tite and Kilikoglou 2002, 1; Tite *et al.* 2001, 322), as well as the porosity of calcareous fabrics. Porosity enhances thermal shock resistance by arresting and preventing cracks from propagating further; when a crack meets a large pore it stops (Arnold 1985, 23). However, high porosity can contribute to the damage of cooking pots during heating (Arnold 1985, 23) and special attention should be taken during firing in order to control the problem of spalling. It seems that the Philia cooking pots of Type a were fired for less than six hours and in temperatures below 600°C[39], to avoid decarbonising and in order for the pots to remain intact after firing (Shoval *et al.* 1993, 271).

More specifically, firing temperatures should not exceed 650°C in an oxidizing atmosphere, or 750°C in a reducing atmosphere (Tite *et al.* 2001, 322). Alternatively, wetting the clay with sea water or adding some salt (sodium chloride) to the clay could restrain calcite decomposition (Rye 1981, 33). This latter solution could actually explain the white or grey coating on many of these cooking pots

[39] A weak decarbonation process in both limestone and monocrystalline calcite, starts at about 600° after six hours of heating in clay matrices and increases with time above this temperature (Shoval *et al.* 1993, 269; see also Bronitsky and Hamer 1986).

(Frankel and Webb 2006a, 101). A final act to prevent spalling involves pot quenching in cold water, immediately after firing is completed and while the pots are still hot (Tite and Kilikoglou 2002, 3; Tite *et al.* 2001, 322).

Ethnoarchaeological research has shown that high-fired, non-calcareous clays, which contain only moderate amounts of temper, offer optimum heat transfer conditions (Hein *et al.* 2008, 42). However, the archaeological evidence from Marki indicates that both non-calcareous (fabric IV) and calcareous (fabric V) fabrics were used for the production of cooking pots during the earlier occupational phases of the settlement. While non-calcareous fabrics continued to be used for the production of cooking pots (fabric VIII), calcareous fabric V ceased to be imported to Marki in EC I-II. This technological change in the use of cooking pot fabrics could be also associated with cultural factors, including the breakdown of the island-wide network of material exchange, and the search for available materials within the new social and economic *status quo* of the EC period, as well as possible changes in dietary preferences, which made fabric V unsuitable for heating.

Even though it was argued that the monocrystalline and polycrystalline quartz occurred naturally in fabric VIII, the selective use of quartz rich clays for the production of this fabric, primarily used in the production of cooking pots, is worth considering. The performance properties of quartz as tempering material have been extensively studied by many scholars (e.g. Rye 1976; Bronitsky and Hamer 1986, 97; Kilikoglou *et al.* 1998). Quartz, the main component of sand, has a higher rate of thermal expansion than does fired clay (Rye 1976), and requires high temperatures to produce a well fired pot due to the phenomenon of quartz inversion (Bronitsky and Hamer 1986, 98).

At approximately 550-573°C, quartz particles increase in size, and when firing temperatures are decreased below this range, the original size is restored, leaving voids around the quartz grains (Bronitsky and Hamer 1986, 98, see also **Figure IV.104.a-b**). The voids formed around the quartz reinforce the vessels' resistance to crack propagation as the stresses are more evenly distributed. However, attention should be paid to the quantity and fraction of the non-plastic mineral inclusions, as these same defects can operate as crack nuclei, creating concentrations of stress that result in greater crack initiation (Bronitsky and Hamer 1986, 97).

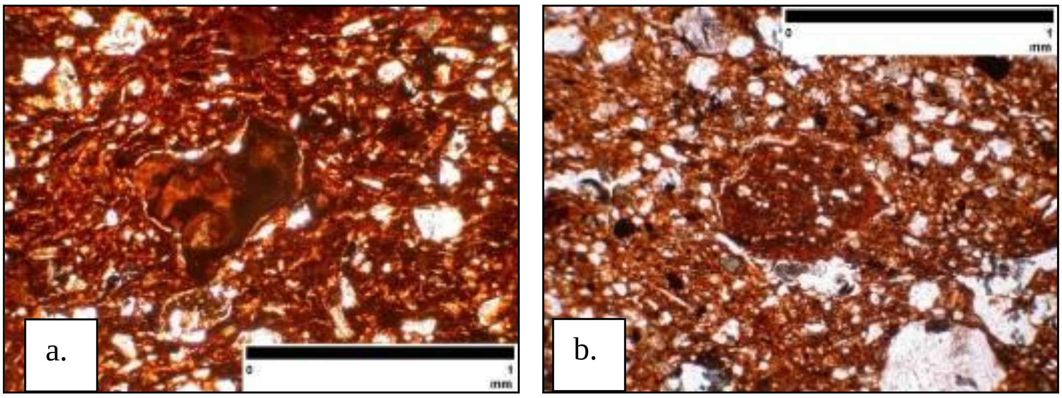


Figure IV.104. a-b. Many aplastic inclusions, such as those in the clay matrices of (**a**) RPC-12942 and (**b**) RPC-9243 increase in size during firing, and when firing temperatures are decreased below this range, the original size is restored, leaving voids around the grains. This is especially true for quartz, the inversion of which takes place around 550-573°C, well below the upper limit of EC-MC firing temperatures (scale 1mm, PPL).

Therefore, the presence of quartz in fabric VIII, which accounts for about 20% of the inclusions in coarse fraction, results in significant energy dissipation (toughening) (Kilikoglou *et al.* 1998, 274). The differential shrinkage/expansion of the clay and quartz inclusions results in the creation of a microcrack network during drying, firing and cooling, a form of "debonding" between the quartz inclusions and the clay matrix (Tite and Kilikoglou 2002, 2).

> "As a result of the formation of microcracks and the debonding, the probability of crack initiation increases and, therefore, the fracture strength decreases with increasing concentration of quartz temper. Conversely, as a result of crack deflection and bifurcation via the microcrack network and at the interfaces between the quartz grains and clay matrix, the dissipation of energy during crack propagation, and therefore, this contribution to the total fracture energy and toughness increases with increasing concentration of quartz temper" (Tite and Kilikoglou 2002, 2).

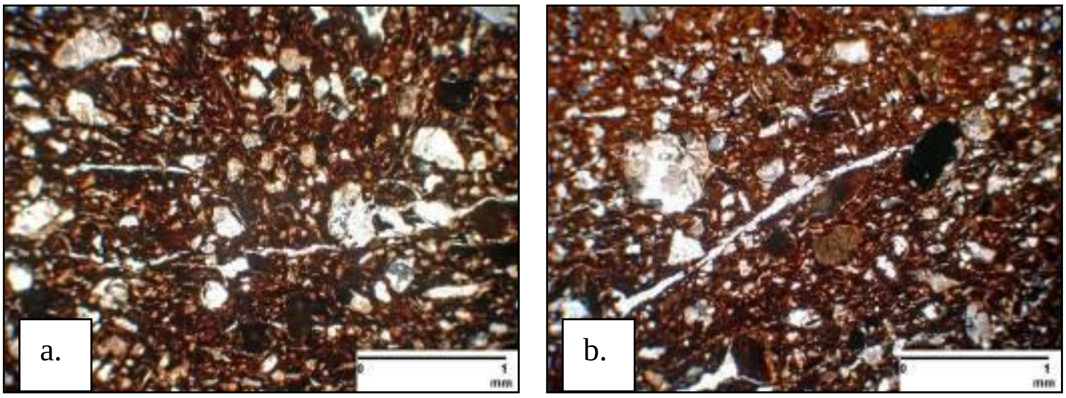


Figure IV.105. a-b. The presence of aplastic inclusions and especially quartz in the clay matrices of cooking pots ensures that the crack networks will not spread detrimentally for the vessels. Both photomicrographs from RPC-12458 (scale 1mm, PPL).

The extensive network of crack nuclei already explained by Bronitsky and Hamer (1986, 97) is a source of toughening enhancement, and ensures that potential cracks in the cooking pots do not spread catastrophically (**Figure IV.105.a-b**). In addition to the naturally occurring quartz, plagioclases and metaquartz in fabric VIII, the voids observed in the clay matrix and also on the surface of the cooking pot examples of both fabrics IV and VIII, resulted from organic tempering which was also used to improve the porosity of the vessels and consequently their resistance to thermal shock (Frankel and Webb 1996, 167).

Even though fabrics IV and VIII were also used for the production of RP vessels of various shapes, and in particular jars (Frankel and Webb 2006a, 133), the cooking pots made of these two fabrics are easily distinguished by a range of co-incident attributes, such as texture, hardness, shape, colour, surface treatment, and wall thickness (Frankel and Webb 1996, 167), all of which contribute to the effective repetitive use and reproduction of these non-calcareous cooking pots throughout the lifespan of the settlement (in contrast to cooking pot fabric V, which ceased to be produced in the EC I-II period). The series of qualities, including strength, toughness and permeability, thermal shock resistance, thermal conductivity and cooling properties (Hein *et al.* 2008), and consequently the cooking pots' effective and durable use, is, thus, not exclusively connected to fabric, but rather to a correlation of texture, hardness, shape, colour, surface treatment, and wall thickness.

While it has been argued that the cooking pot type was significantly refined and standardised from EC III onwards, there are certain features that remained unchanged from the very beginning (Frankel and Webb 2006a, 133). The non-calcareous fabrics IV and VIII remain consistently medium to coarse in texture, and dark coloured (also Frankel and Webb 2006a, 133). There is a general belief that the colour of the pot can contribute to the efficiency of its function. If white or light coloured vessels are preferred for storage because of their heat reflectivity (Arnold 1985, 22), the darker colour of non-calcareous, volcanic clays is suitable for retaining heat, especially when pottery is a poor heat conductor (Arnold 1985, 23, see also Frankel and Webb 2006a, 133; 1996, 167). The carbon coating on the exterior surface of the pots also contributes to their capacity to retain heat (Rye 1976:113; Frankel and Webb 2006a, 135).

The shape of these pots is another important factor for improving cooking pot functionality.

> “They are ovoid and relatively deep-bodied to conserve heat, have large openings for adding and removing food and a low neck with flaring rim to help prevent boiling over and reduce evaporation during prolonged heating. The rim end is flattened to strengthen it against breakage, at the same time avoiding any reduction in resistance to thermal shock which would be caused by a pronounced or angular rim” (Frankel and Webb 2006a, 135).

Potters also took extra care to produce pots of uniform thickness. On all recorded examples, the difference between the minimum and maximum wall thickness in different parts of the pots rarely exceeds 3 mm (Frankel and Webb 2006a, 135 and 1996, 168). Even the handles were attached to the exterior surface rather than through the vessel wall, even though the latter is the most common and widespread technique in RP ware, taking extra care to avoid any sudden increase in wall thickness at the point of attachment (Frankel and Webb 2006a, 135). Wall thickness is a significant factor affecting the magnitude of the thermal shock stresses. During firing and cooling, the differential expansion or contraction of the inner and outer surfaces and the resulting temperature gradients through the vessel wall are the primary driving force for thermal shock stresses (Tite and Kilikoglou 2002, 1). Therefore, it is no surprise that the cooking pot wall thickness was reduced over time, after EC III, reaching the range of 5-7 mm (Frankel and Webb 2006a, 134-135). The thinness of the pots’ walls facilitates the conduction of heat, minimises thermal differentiation between the external and internal surfaces, and allows moisture to rapidly become steam during cooking, preventing it from building-up in the cooking pot body (Rice 1987, 229, 231; Frankel and Webb 2006a, 135).

Moreover, the magnitude of stresses also depends on the cooking pot shape. The stresses for globular shaped vessels are less than for those with angles at different joints across their bodies (Tite and Kilikoglou 2002, 1). The Marki cooking pots belong to two different types, one having a globular body and the other one having an ovoid body. In EC III, cooking pots become more standardised with a globular body and thin, even walls (Frankel and Webb 2006a, 135).

Overall, it can be argued that EC and MC cooking pots follow a steady evolution from *ca.* 2400 to 1700 BC, when the settlement is gradually abandoned. During the Philia phase, there are two cooking pot fabrics in use at the settlement, IV being locally made and V imported. After EC II, fabric V ceased to be imported to the settlement, but fabric IV continued in use and became one of the main fabrics for the production of a variety of RP and RPC shapes. The mineralogical and chemical consistency of fabric IV suggests that potters systematically exploited the same raw material resources for the manufacture of this fabric.

Around EC III, fabric IV was replaced by fabric VIII for the production of cooking pots and other RP utilitarian shapes. Like fabric IV, fabric VIII was used for both RP and RPC, as 34% of fabric VIII consists of RP vessels and the remaining 66% RPC, suggesting that at Marki at least, no local fabric had ever become exclusive to cooking pots, or any other type of vessel, and that throughout the lifespan of the settlement the fabrics produced served different types of wares.

Therefore, even though from EC III cooking pots, and in particular the two-handled type,

> "show a remarkable degree of adaptation to function and are distinguished by a range of coincident attributes including temper, texture, hardness, shape, colour, surface treatment and wall thickness" (Frankel and Webb 2006a, 135),

the fabric used for their production was also used for a series of other vessels for local consumption. Volcanic clays, rich in igneous inclusions, which could make thermal shock resistant, strong and durable cooking pots were also useful for other functional types. What differentiates cooking pots from other pottery types made with the same fabrics is the subsequent pot building and surface treatment, as shape and wall thickness are important factors affecting the durability of these specialised vessels.

IV.4. Ceramic production, distribution and social interaction at EC-MC Marki.

The multidimensional analytical study of RPP, PRS, WPP, RPCP/RPC, CW and ERS samples from Marki has provided substantial information on the technology of Philia, EC and MC pottery production at the settlement, filling a significant gap created by the absence of direct evidence about the manufacture *loci* and tools. It also provided an insight into the scale of ceramic distribution at the settlement and the degree of social interaction with the surrounding insular world. The detailed macroscopic description of each individual sherd of the entire diagnostic assemblage by Frankel and Webb provided not only a sound basis for sampling but also for the interpretation of the analytical datasets, enabling the sample analysed in this study to be contextualised in terms of the entire assemblage.

This research has shown that the EC-MC potters of the Marki community made use of locally available clays, which are characterised by a strong igneous character. Little effort was made for the refinement of clays used for the manufacture of everyday, domestic pottery. The evident alluvial character of the clay of many of these artefacts, as well as the strong sedimentary character of that of hobs and loomweights, indicates that the potters did not travel far to obtain the necessary raw materials, but rather made use of the readily available, nearby Alykos riverbed deposits. In particular, the analytical results suggest the predominant exploitation of alluvial mélange for the production of a series of utilitarian ceramic artefacts and shapes, including hobs, loomweights, mealing bins, pans, pithoi, and small and large closed and open vessels.

The most standardised aspect of local ceramic production at Marki is the selection of very fine, iron-rich clay for the decorative slip, which would facilitate the achievement of the characteristic red surface of RPP and RP pottery. Conversely, it appears that all sorts of clays, locally produced at Marki, were employed for the ceramic bodies, including both calcareous and non-calcareous, coarse- and fine-grained fabrics with little or no preparation. The only other unambiguous pattern in clay selection is the use of non-calcareous clays for some cooking pots.

Altogether, the analytical findings reveal a good understanding of the properties of different clays and of the specific technical requirements of, for example, red slips or cooking pots. Local fabrics, such as II, VI and VIII include a variety of shapes, such as pans, vats, medium size jars, and large and small bowls. Utilitarian shapes associated with domestic activities, such as food processing, were made indiscriminately employing both calcareous and non-calcareous clays.

From about 2400 BC until about 1700 BC, when the settlement was gradually abandoned, several aspects of ceramic production related to the production and application of ceramic slips or firing temperatures remained the same. The application of non-calcareous, iron-rich clays, as slips, is observed diachronically, on all kinds of fabrics (both calcareous and non-calcareous bodies), from all the different phases of the settlement. In addition, the high magnification images of cross sections of samples from different phases of the site, show a conspicuous lack of vitrification of the clay particles, suggesting that the firing temperatures did not exceed 750-800 ºC (Maniatis and Tite 1981), a feature that remained unchanged throughout the EC and MC periods.

However other aspects of ceramic production related to the exploitation and processing of raw materials present changes from the Philia to the EC I-II period, and from EC I-II to the EC III period. The main technological changes recorded between the Philia and EC I-II at Marki include the intensification of the use of igneous fabrics and the decrease in the compositional homogeneity of fabrics (as seen in fabric I). Moreover, cooking pots made with limestone-tempered fabric V gradually cease to be found at Marki in EC I-II.

EC III is considered a turning point in local ceramic production for two main reasons. Around this time (ca. 2100-1900 BC), potters started to process clays more thoroughly for the production of some fabrics (e.g. fabric X – RP small bowls). It is also during this time that imported fabrics at Marki become more easily identified, either due to an increase in contacts and ceramic exchange or because fabrics became more standardised and thus more easily distinguished, or both. A reduction in the size and density of inclusions is evident over time. Chronologically later fabrics, such as IX, X, XII and XIII, are characterised by a finer texture, as they become more thoroughly processed.

Moreover, over time, the amount of calciferous materials present in fabrics seems to diminish, and a wider range of non-calcareous clays rich in volcanic material seems to be preferred. This is evident in the use of fabric IV, a fabric which was already in use during the Philia phase for the production of Type b cooking pots and mealing bins (e.g. CW-10224), and which from EC I becomes more widely used for a series of wares and shapes, including CW, RPC and RP. This fabric is also used for the production of RP mottled pottery, which during EC I-II seems to be one of the most distinct pottery types produced in the central and southern parts of the island.

While a range of different fabrics is used for the production of RP pottery, cooking pots in the EC and MC periods are consistently made of coarse, non-calcareous, micaceous clays (biotite mica), rich in polycrystalline quartz and metaquartz (there are no cooking pots in fabrics II, VI, VII, XII). This supports existing arguments about the exploitation of specific types of clay when the vessel's effective performance required special properties, and the arbitrary use of both calcareous and non-calcareous clays when the clay properties did not affect its effective use (c.f. Barlow 1996a; Barlow and Idziak 1989; Frankel and Webb 1996; Summerhayes *et al*. 1996).

It seems that Early and Middle Bronze Age potters at Marki had a good understanding of the various clays and their properties, but they only invested time for the selection of specific clay types when the shapes to be produced required special properties for functional effectiveness and durability. While the same igneous fabric is used for the production of cooking pots and other RP pottery, in EC III, cooking pots in particular become more refined and standardised. This shift towards standardisation is not associated with the fabric used for their production, but rather with the techniques used for building and shaping these pots.

A similar observation was made by Herscher, who argued that cooking pots at Ayios Prodromos form an extremely homogeneous group. Her morphological descriptions of cooking pot shapes are in accordance with those by Frankel and Webb;

> "all have ovoid bodies, wide mouths, and slightly flaring rims; a neck is not articulated. Those without tripod legs usually have a slightly flattened base, although generally not flat enough in order for the pot to stand independently, in the two handle version, the one handle is always considerably larger than the other. The only decoration found is the occasional addition of a vertical lug on the neck opposite the handle on the one-handled types, and frequently a simple vertical incised line on the handles" (Herscher 1988, 151).

Similar one- and two-handled cooking pots have been recorded at Kition, Kalavasos and Alambra (Herscher 1988, 151). At Alambra, Barlow included cooking vessels in a sub-category of her RP B type, all made with an entirely volcanic fabric (Barlow 1996a, 261), like Marki's fabrics IV and VIII. It seems that cooking pots from different settlements are made with a similar fabric, but differ in shape and decoration. For example, the Kalavasos cooking vessels have a different lug type and none have incised handles. Cooking pots from north coast sites are quite different, with handles of equal size, more articulated necks, and again very different lugs (Herscher 1988, 151), while cooking vessels from Sotira *Kaminoudhia* in the south have wide flat bases, fairly globular bodies and two opposed handles that are quite similar in size, although one is usually more angular than the other (Herscher 2003, 186).

The overall impression given is that cooking pot shapes followed local patterns, and they were made with locally available volcanic clays, as the physical properties of this type of clays serve well the vessels' function. While various parameters of the cooking pots' morphology were refined and became more standardised during EC III, the techniques of fabric selection and processing did not alter, nor become more standardised. Even though only specific fabrics were used for cooking pot production, these fabrics continued to be used also for the production of other RP shapes (**Figure IV.106**). This observation is also attested for the other two excavated settlements, Sotira (Herscher 2003, 186) and Alambra (Barlow 1996a, 261).

Another indication against the standardisation of EC and MC fabrics is the fact that different types of cooking pots at Marki are made with the same fabric. While the cooking pot shapes in EC III become more standardised and can be easily distinguished from other coarse RP vessels (Frankel and Webb 2006a, 133), they continue to be made with the same fabric. Hence fabric VIII was used for the production of different types of cooking pots, including tripod cooking pots (RPC-7193, RPC-11478, RPC-15382, RPC-16395 and RPC-16677), flat-base cooking pots (RPC-12942), cooking pots with unpierced lugs below their rims (RPC-9176, RPC-12458), cooking pots with widening necks (RPC-9062, RPC-9243, RPC-15183), cooking pots with concave necks (RPC-9176, RPC-12823), large cooking pots (RPC-9176) and small cooking pots (RPC-12458). The potters at the settlement exploited the same raw material resources and followed the same recipe for the production of all these different types of cooking pots.

Among the thirteen mineralogically defined fabrics from Marki, only two can be directly associated with the production of specific wares. Fabric V was used exclusively for the production of Philia cooking pot Type a (**Figure IV.106**), and fabric XIII exclusively for the production of ERS vessels (**Figure IV.107**, see also **Table IV.8**). These two are among the very few fabrics which actually correspond to very consistent chemical groupings, indicating that their composition is not only very homogeneous within their groupings, but also distinctively different from the other recorded fabrics. It should also be noted that both fabrics are considered to be imports at Marki.

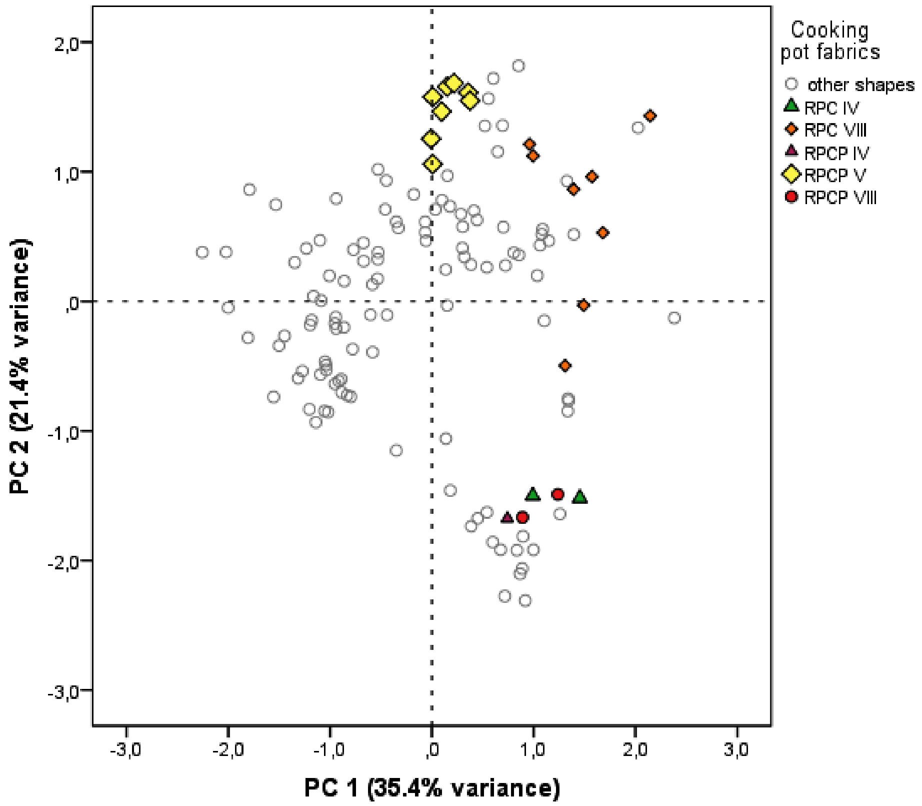


Figure IV.106. PCA scatterplot based on the ED-XRF dataset. The samples marked are cooking pot fabrics against the rest of the Marki sample (in the legend, IV, V and VIII correspond to the defined fabrics).

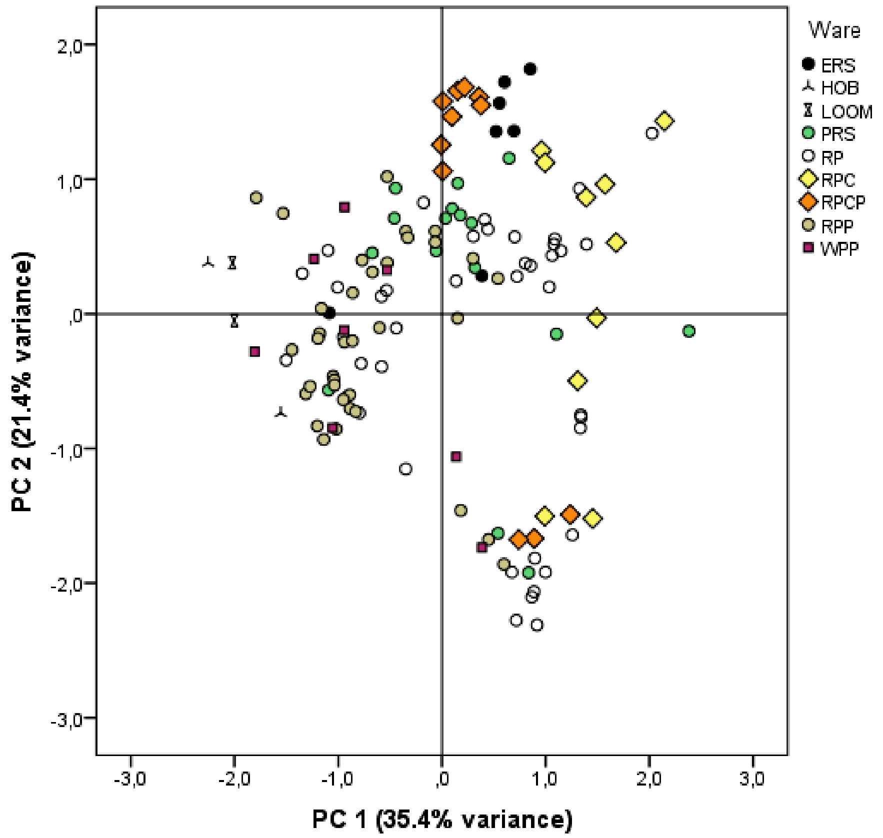


Figure IV.107. PCA scatterplot based on the ED-XRF dataset. Samples are marked according to the ware to which they belong.

On the other hand, the fabrics that are believed to be locally made at Marki due to their utilitarian character are not as homogeneous within their compositional groupings like fabrics V and XIII. Overall, it is argued that ceramic production at Marki primarily aimed to serve the everyday, domestic activities of the inhabitants with relatively little attention to detail. Somewhat more systematic attention was given only to those vessels, such as cooking pots, the efficient use of which required special fabric properties.

As has been discussed in Chapter I, apart from Frankel's work (1994; Frankel 1991; Frankel 1988; 1974a; 1974b) and a more recent article by Frankel and Webb (2001a), the EC and MC literature lacks discussions about the organisation of ceramic production. This issue was only addressed by Frankel and Webb, who revised Frankel's initial argument in favour of local, small-scale production units (Frankel 1981, 96-97), proposing a "model of elementary specialisation" (Frankel and Webb 2001a).

According to Frankel and Webb's population estimates during the lifetime of the settlement at Marki and estimated household pottery discard/replacement rates, individual households were unlikely to produce their own pottery, as their replacement requirements fall below a level of economic efficiency (Frankel and Webb 2001a, 126). Thus, the scholars argued that it may have been more efficient, for a small number of local "potting households" to engage in part-time manufacture and exchange (Frankel and Webb 2001a, 126). This "model of elementary specialisation" can also explain the relatively restricted compositional variability among the Marki local sample, as well as the low degree of standardisation characterising the Marki local fabrics, in comparison for example with the more standardised and widely distributed Philia fabric I (Frankel and Webb 2001a, 126). The potters at Marki were producing simple shapes suited for everyday domestic activities and other utilitarian tasks.

With the exception of the Philia facies cooking pots of Type a, all the rest of the imported ceramic material at Marki is of fine quality, easily distinguished from the coarser local products. This is especially evident in the incised pottery assemblage. Imported incised RP vessels of all periods are made of fine-textured, calcareous clays with high plasticity and low shrinkage, the most suitable properties for the application of incised decoration (Barlow 1991, 55). The elaborate incised motifs on these vessels seem to have been executed with great care. In contrast, the local incised pottery, which is very limited in all phases, is made of alluvial clays whose aplastic inclusions obstructed the execution of the incised decoration. Decoration was thus restricted to simple, plain motifs.

The imported pottery at Marki reflects a considerable degree of interaction between the settlement and different regions of the island, both in the north and south. Fabric variability in RP classes, including fabrics VII, XII and most of the outlier samples, indicates that these were imported from numerous, different production centres. RP-7256 suggests some kind of interaction with the north, while the fabric with which RP black-topped RP-14957 is made, is suggestive of its import from Deneia. Moreover, the presence of ERS pottery made with at least two different fabrics, namely VII and XIII, suggests that this ware was not imported to Marki from a specific production centre, but were rather imported from various production centres, indicating a complex network of interaction.

It seems that especially from EC III onwards, some essential rules, forming an island-wide tradition, were in operation for the production of RP pottery, especially the incised and black-topped sub-varieties as recorded in the Marki sample. It is observed that while there is a range of different fabrics for the production of these RP sub-varieties, reflecting their production at different workshops using different material resources, they are all made with finely refined calcareous clays. This is more evident at Deneia, a large production centre of RP incised and black-topped pottery (Frankel and Webb 2007; Dikomitou 2007), which was not restricted to local consumption but also regional distribution.

The small village community at Marki developed a local ceramic production system that corresponded to the everyday needs of the community, making use of what was readily available in its vicinity. In addition to possible local production, the needs of the community were supported during the Philia and EC I-II periods by other settlements of the Philia social network (e.g. RPP, PRS and WPP made with fabric I and cooking pots of Type a made with fabric V), and subsequently by other neighbouring communities of the central-south region (RP and RPC made with fabric IV), and it is only in ECIII that imports became restricted to fine pottery. The fine pottery imported to the site appears to reflect a different scale and context of production. At least some potters in the distributing pottery centres are assumed to have been operating beyond the small-scale, household-based workshops (Frankel and

Webb 2001a) proposed for Marki, producing pottery for large-scale distribution to other communities.

Both in terms of technology and organisation, it appears therefore that EC-MC pottery production on the island operated in at least two modes. Ceramic production at Marki belonged to a more modest mode, perhaps typical for most villages in central and south Cyprus, and probably more widely. The Marki inhabitants produced and used their own locally made ceramics for most everyday activities. However, the restricted quantity of 'more exotic' pottery imported to the settlement in all phases bears witness to the community's continuous contacts and links with its adjoining world.

After a lifespan of five hundred years of uninterrupted habitation, Marki was gradually abandoned in the MC II period. It is argued that the continuous population growth, which reached approximately four hundred people by MC I, could be one of the reasons for the settlement's gradual abandonment, due to diminishing resources (Frankel and Webb 2006a, 308). Moreover, fissioning and relocation could be encouraged by the changing socioeconomic and political configurations in the later MC and LC periods, and the emergence of well-defined networks between newly-rising larger economic and political centres on the coasts, inland centres, and agricultural and mining settlements (Keswani 1993; Frankel and Webb 1996, 2).

CHAPTER V

RESEARCH CONCLUSIONS AND PROSPECTS FOR FUTURE WORK

V.1. Research design and objectives.

Around half a millennium after the surrounding world, including Egypt, the Syro-Palestinian coast, Asia Minor and the Aegean entered the Bronze Age (Knapp 1988, v), Cyprus followed (Frankel 2005). At the beginning of the Cypriot Bronze Age, the Philia phase (*ca.* 2500-2300 BC) is marked by a series of cultural changes associated with all aspects of the island's material culture, which, followed by the "peaceful and uneventful" EC and MC periods (Iacovou 2008, 225, *ca.* 2300/2200-1700 BC), manifest the island's introduction to the new cultural era and gradual course towards LC urbanisation.

Collectively or individually, the Philia, EC and MC periods are often regarded as the humbler path to the LC urban centres' cultural grandeur and the island's outburst of interaction with the outside world. This thesis focused on the Philia, EC and MC periods for their own merit and key contribution to the island's cultural evolution. Specifically, this thesis provided an account of and the reasons for the significance of these periods in Cypriot prehistory by recording technological changes in contemporary pottery, both in time and space, and extracting from them knowledge regarding ceramic production and distribution in the Philia, EC and MC societies.

If "in archaeology all inference is via material culture" (Hodder 1991, 3), then in Cypriot Early and Middle Bronze Age archaeology, inference is chiefly via contemporary pottery. In the limited stratified, domestic Philia, EC and MC archaeological contexts, pottery, by far the most abundant class of material, becomes a critical tool for evaluating technological change, interregional synchronisms, and intra- and inter-regional contact during these periods.

In the absence of investigated settlement sites in the northern part of Cyprus, and considering the restricted evidence coming from the three excavated settlement[40] sites in the central and southern parts of the island, ceramics become essential assets for understanding the society that produced, exchanged, used and discarded them. In view of the restrictions imposed by the currently available EC and MC archaeological

[40] These three settlement sites are Marki *Alonia*, Alambra *Mouttes* and Sotira *Kaminoudhia.* Basic information about the material culture from Pyrgos *Mavrorakhi* still awaits publication, and thus at present this latter site is not considered among the excavated settlements that provide the groundwork for understanding the EC and MC culture.

record, the focus of research was set on pottery that could be either confidently identifiable as belonging to a specific period with a clear temporal and spatial range, and/or stratified, well-published ceramic wares with a marked temporal and spatial continuity, from the Philia to the MC period, for the diachronic evaluation of technological variation.

The project was articulated in two case studies. For an inter-site and island-wide, synchronous investigation into ceramic traditions, RPP pottery was appraised as the most appropriate ware. RPP is the predominant ware during the Philia phase, and presents a notable morphological homogeneity across Cyprus, distinguishing a relatively short phase with distinct technological patterns, from the succeeding EC and MC periods, thus allowing the confident dating of the sites where it was recovered. This is a ceramic ware that can be easily distinguished from the ensuing RP pottery, and that facilitates inter-site synchronisms, a prerequisite for an inter-site study.

For an assessment of technological variation in time, from the Philia to the MC period, the main pottery classes from the successive, well-recorded strata of the settlement at Marki were considered as the most suitable for sampling. Marki is currently the only settlement in Cyprus that offers stratified material from Philia and EC I-II domestic contexts, in an uninterrupted succession with EC III and MC I/II strata of settlement activity, facilitating a diachronic study of Philia, EC and MC pottery technology at a single settlement.

The time limits of this study were defined by the chronological lifespan of Marki from the Philia phase until MC II (*ca*. 1700 BC), when the settlement was gradually abandoned. This chronological span agrees well with broader cultural changes observed on an island-wide level, as after MC II and throughout MC III/LC I, many inland settlements contemporary with Marki seem to be abandoned, while a number of mostly newly-founded coastal sites, such as Enkomi, Palaepaphos and Hala Sultan Teke emerged, signalling the commencement of the island's course towards urbanisation. Two coherent studies were, thus, designed employing a range of analytical techniques focusing on the main pottery classes at the settlement and addressing specific issues of ceramic technology and distribution, rather than spreading across wares, and thereby restricted to smaller and less reliable samples.

RPP pottery from Marki and other regions of the island was sampled for the first case study. Sampling was focused on standard RPP pottery from eight sites across the island, representing all the regions of Cyprus where Philia material was recorded. When possible, examples of the various RPP sub-varieties were included, such as incised, stroke- and band-burnished, and irregularly fired vessels, in order to assess the degree of fabric homogeneity among them, and how they are similar or differ in their manufacture, in addition to the obvious differing external surface treatments.

RP and RPC almost monopolised research interest in the second case study to allow a detailed assessment of the principal, probably local, products at the site. In order to provide a more comprehensive picture of ceramic production and distribution at Marki, other types of ceramic artefacts of probable local provenance, such as fragments of hobs, loomweights and mealing bins, were also included in the sample. In addition, an apparently imported ware, namely ERS, was sampled to provide an explicit contrast to local manufacture. In order to complete the picture of ceramic production at Marki from its foundation in the Philia phase until its abandonment in MC II, RPCP samples were also selected for a technological comparison with later RPC. WPP and PRS completed the Philia sample, providing a broad picture of ceramic production and distribution at Marki during the Philia phase.

An initial macroscopic study of the selected samples was followed by an analytical strategy which combined the mineralogical and chemical characterisation of ceramic samples using polarising optical microscopy and ED-XRF. In addition, SEM-EDS and SEM high magnification imagery were used respectively for the chemical characterisation of ceramic slips and an investigation into the degree of clay particle vitrification for the estimate of pottery firing temperatures. This was the first time that a single study of Cypriot ceramics combined more than one method of scientific analysis, providing complementary information about ceramic technology, with particular cross-references to ceramic wares and the fabrics used for their production.

V.2. Ceramic production, distribution and social interaction during the Philia phase.

The most recent research on the Philia phase has strongly argued the establishment of contacts between Cyprus and the surrounding world already in the Chalcolithic, and the intensification of these relations during the Philia period (Peltenburg 2007; Bolger 2007 and Webb *et al*. 2006 respectively). The introduction of new technologies of metalworking and the more systematic exploitation of the island’s copper deposits were significant factors motivating the involvement of

Cypriot communities in the Mediterranean metal exchange networks during this time, and *vice versa*.

The material homogeneity linking the various Philia communities within the island, most clearly demonstrated by ceramic assemblages (Webb and Frankel 1999), suggests a well-established network of interaction among these communities. The present study was designed to assess the extent of this material homogeneity, and in particular, the stylistic uniformity in pottery during the Philia phase, and to investigate whether this morphological uniformity resulted from the local use of similar techniques and materials in pottery production by different communities or the production and distribution of pottery across the island from a specific single or regional production centre. Resolving this issue would add a new analytical dimension to our understanding of the nature and operation of the Philia network of interaction, and the type(s) of socioeconomic relations between the communities that sustained it.

Overall, the technological study of the Philia ceramic sample has indicated that a common recipe was used for the production of all the identified Philia fabrics, which includes the use of fine clays, vegetal temper, and low firing temperatures, which did not exceed 750-800ºC. There are neither indications for deliberate mineral or rock tempering, nor any detailed clay refinement procedures. On the other hand, the clays used for the production of the ceramic slips are non-calcareous, iron-rich, and well-refined. These observations apply for all samples from all sites, and made with different fabrics[41].

One of the most significant findings to emerge from this study is that 75% of the entire RPP sample (**Table III.3**), from all the eight sampled sites, from Vasilia in the north to Kissonerga to the south-west, is made with the same fabric I. This large percentage of RPP samples was found to be both mineralogically and chemically very homogeneous, and compositionally very different from all the other recorded fabrics (**Table III.3** and **Figure III.28**).

Fabric I is a calcareous fabric, for the production of which the standard RPP recipe was followed, but it is differentiated from the other identified fabrics due to the prominent presence of metamorphic rocks and the very restricted presence of igneous inclusions, indications that the location of raw material resources was not in the

[41] Similar non-calcareous, iron-rich, red firing clays were used until recently at Kornos for the production of pottery (Barlow 1996a, 242).

vicinity of the Troodos pillow lavas. Most importantly, fabric I is characterised by a distinct presence of chert and other quartzitic inclusions, which are not found in any of the other defined fabrics (**Figures III.8.a-d**). The vessels made with fabric I are not only mineralogically easily distinguished from all the other samples in thin section, but they are also more standardised in terms of elemental composition. The mineralogical and chemical uniformity of the RPP samples made with fabric I suggests that the corresponding vessels were either made by a single production centre, or by a regional cluster of production centres exploiting the same raw material resources in very comparable ways.

With reference to the place of origin of fabric I, it can be argued that the raw materials for the production of this fabric derive from the northern part of Cyprus, far away from the Troodos ophiolite, in a region where sandstones, clays, and marls are dominated by quartz fragments, as well as cherts and metamorphic rocks, such as quartzite, metachert and mica schists (Ducloz 1972, 5, 38), with plagioclases, serpentine, iron oxides and planktonic microfossils being less abundant (**Figure III.53**; Constantinou 2007, 338; Xenophontos 2002, 44; Xenophontos *et al.* 2002, 177). While from petrographic and geological standpoints, becoming more specific about the provenance of fabric I is currently not feasible, from an archaeological point of view, there are two candidate areas for the production and distribution of fabric I. The sheer quantity of RPP vassels made with fabric I coming from the Ovgos valley and the infrequent presence of any other recorded fabric among the samples from this region suggest that fabric I could be locally made in one or more production centres in the Ovgos region.

Another candidate could be Vasilia, which is currently distinguished from all its contemporaries for the wealth of its material record. Vasilia, located on Cyprus' north coast, commanding an excellent harbour, as well as a communication passage at the western end of the Kyrenia Mountain range (Webb *et al.* 2006, 279, Stewart 1962, 288; Georgiou 2006) is distinguished from all the other recorded Philia sites for the large numbers of metal artefacts found there (Webb *et al.* 2006), and other exotic artefacts, such as alabaster vases (Keswani 2004, 63; Hennessy *at al.* 1988). If this was indeed the case, then Vasilia could possibly operate during this time, both as a gateway outside Cyprus, and as a key community for the distribution and exchange of materials within the island. Nevertheless, it should be highlighted that all these remain assumptions based on inadequate evidence, and until a geochemical survey of Cyprus provides detailed information about the geological environment across the island, we cannot be really sure about the provenance of this widely distributed fabric I.

As the analytical work indicates, this widely-distributed fabric I is not only used for the production of RPP, it is also used for the production of the PRS and WPP which reached Marki. This information is particularly interesting when considering the morphological characteristics of PRS ware. PRS is "relatively crudely made", with medium to thick walls, uneven surfaces and irregular rims (Frankel and Webb 2006a, 98, Fig. 4.10, Pl. 49), in contrast to the fine, thin-walled and lustrous RPP and WPP pottery. This technological contrast led Frankel and Webb to argue that PRS was made in a different context of production than RPP, and that it was possibly made by inexperienced potters (Frankel and Webb 2006a, 91, 98).

The presence of PRS-9121 in Philia fabric I makes one wonder whether a subset of the vessels should be categorised as RPP rather than PRS, and whether there is a technological overlap between the two wares. As this study has shown, there are several shared techniques among the Philia wares. These mainly include raw material selection and preparation, ceramic shapes and firing. Therefore, an overlap between RPP and PRS is not groundless, especially if some of the vessels attributed to these wares were made by the same potters.

Moreover, all recorded Philia fabrics were used for the production of PRS pottery, while some PRS are also found among the outliers. This fabric variation within the PRS sample indicates that at least some PRS vessels were not made locally at Marki, but they were imported from elsewhere. One potential source of circulation could be the north, as one PRS vessel was found to be made with fabric I, while PRS must have been imported to Marki from other communities within the central-south region, as the strong igneous characteristics of fabrics II, III and IV, the 'reduced' fabric, and the outliers suggest. Considering all this information, the suggestion that PRS was manufactured by inexperienced potters may not be the only possibility, and other explanations should be sought. One possible explanation is that PRS was deliberately made with less effort, time and experience invested in its production, as it was used primarily in domestic environments and in particular for the preparation of food (Frankel and Webb 2006a, 99).

It is clear that the production centre or centres producing and distributing fabric I were not constrained only to the production of RPP pottery, and that fabric I was used also for the production of WPP and PRS vessels. Philia fabric I also presents many similarities with fabric V, used for the production of the Philia Type a cooking pots. Fabrics I and V are the only two fabrics characterised by metamorphic components, in the form of chert and quartzite. Both fabrics could have originated in the same broad geological zone, in the north, even though the cooking pot fabric was tempered with sand (**Figures IV.9** and **IV.10**).

According to Frankel and Webb, Philia cooking pot Type a vessels were found in a number of Philia tombs, such as *Laksia tou Kasinou* (Dikaios 1962:173, figs 83.21, LII.12), Episkopi *Bamboula* (Benson 1972:66, B47, pl. 16) and Sotira *Kaminoudhia* (Herscher 2003:186, Tombs 1/1 and 15, P91, Type B, fig. 4.15, pl. 4.6a, references provided by Frankel and Webb 2006a, 100), while cooking pot vessels of Philia Type b are only known from Marki (with the possible exception of a vessel from a tomb at Sotira (Herscher 2003:186, P23, Type A, fig. 4.15, pl. 3.6b, reference provided by Frankel and Webb 2006a, 101). If indeed the tempered Philia cooking pot Type a was produced and distributed across the island along with RPP, PRS and WPP pottery, then the production centre (or cluster of centres) that produced and distributed all these different types of pottery must have produced and circulated a significant proportion of Cyprus' ceramics during the Philia period.

This represents considerable labour investment that operated beyond household level production, significant material resource exploitation, as well as the management of a material exchange web that depended on this centre(s) to satisfy its needs in ceramics, and most probably other products. The range of circulated pottery, which includes both fine and coarse pottery, also undermines any arguments about the exclusive production and circulation of elite products, and in particular the conception of RPP pottery as specialised pottery associated with an emergent elite (Manning 1993, 48), or as a valued prestige assemblage distinguished as a specialist type and technology across the island (Manning and Swiny 1994, 166).

On the contrary, it is argued that during the Philia phase an island-wide network of material and social interchange operated circulating both fine and coarse pottery to contemporary communities, the larger settlements most probably sustaining the smaller settlements providing them with all sorts of different crafted products. Among them, one large production centre, or a cluster of neighbouring centres operating in the same tight geological region, produced most of the pottery circulated within this network. The fact that it produced and distributed both fine RPP and WPP, and coarser RPCP and PRS, suggests that this centre's (or centres') operation should not be associated with the existence of an elite class, but rather to the existence of closely-linked communities, sharing common cultural patterns.

In addition to the broadly-distributed Philia fabric I and cooking pot Type a fabric V from the north coast, a series of other Philia fabrics are associated with the geology of the central-south region. Unfortunately, it is currently impossible, without the existence of detailed information characterising soil samples across a very large region, to determine which of the remaining Philia fabrics are locally made at Marki and which are imported from elsewhere within the south-central region. Moreover, the attempt by Barlow and Vaughan to petrographically assess whether fabric could be used as a criterion for ceramic classification on an island-wide level, showed that most of the RP pottery fabrics share common characteristics making any attempt to pinpoint their provenance very difficult, almost impossible (Barlow and Vaughan 1999; 1996). For this type of work, now more than ever, the chemical characterisation of soil samples and the creation of a geochemical databank is a necessity.

Despite the inability to determine which of the four igneous Philia fabrics were made locally at Marki, and which were imported from elsewhere, it can argued that the presence of these igneous fabrics is indicative of the existence of smaller-scale regional communication networks in addition to the island-wide network of material exchange. Therefore, it could be argued that at least two different types of social interaction networks could concurrently operate in Cyprus during the Philia phase. A wider, dendritic network could link different communities across the island to those located on the north coast, while another, more restricted network could focus on much more local linkages between neighbouring settlements. Within these two different types of interconnections, different ceramic types could have circulated. A good example is the coexistence of Marki fabrics V and IV for the production of cooking pot Types a and b respectively, reflecting the twofold nature of social interaction during the Philia phase.

In addition to differences in vessel shape, Type a is made with a calcareous fabric, while Type b is made with a non-calcareous fabric. The two cooking pot types without a doubt belong to two different technological traditions, suggestive of the settlement's participation in an island-wide network, which distributed cooking pots of Type a, also known from other settlements, while at the same time participating in a more restricted, regional network favouring the production and use of Philia Type b cooking pots. As shown by the analytical results, at the end of the Philia phase, Philia

Type a cooking pots ceased to be used at Marki, while Philia Type b cooking pots became the main cooking pot type in use at the settlement in EC period (see also Frankel and Webb 2006a, 133), until it was gradually replaced in EC III/MC I by a new cooking pot fabric, namely fabric VIII.

Another indication of the growing regionalism replacing the once unified Philia culture is the use of the same biotite-rich, non-calcareous fabric IV for the production of RP mottled. As has been explained in the preceding chapter, RP mottled is an early sub-variety of RP, primarily associated with EC I-II contexts in central and southwest Cyprus (see also Georgiou, Frankel and Webb forthcoming; Eccleston, Frankel and Webb forthcoming). The use, henceforward, of Philia fabric IV for the production of this regional RP sub-variety reinforces the earlier argument about the regional character of fabric IV, which was already in use in the Philia phase and continued to be used during EC I-II.

Considering the comparably geologically mixed deposits characterising most of the region across the Troodos foothills, it is very difficult at present to suggest a specific source within this broad region for this Philia-EC fabric IV (or any of the other identified fabrics). In addition to Marki and *Ayia Paraskevi*, this distinctively rich in biotite mica fabric is also found at Kalavasos, Episkopi and Sotira (**Figure IV.99**, Barlow and Vaughan 1996), all of which are located in the same broad geological region around the Troodos and have access to similar materials (**Figures I.1** and **III.53**).

The remaining Philia fabrics are almost exclusively associated with the ceramic samples from Marki, with the exception of one sample made with fabric IV that comes from *Ayia Paraskevi* (**Table III.3**). Fabrics II, III and IV, and the three "reduced" PRS share similar igneous mineralogical characteristics, which suggest that the raw materials for the production of these fabrics were collected from the vicinity of the Troodos pillow lavas.

The mineralogical similarities between these fabrics and their association with the Troodos broader geological zone, endow their production and distribution with a regional character. Considering the igneous characteristics of these fabrics and the fact that almost all of them come from Marki, and the remaining one from neighbouring *Ayia Paraskevi*, it is possible to argue that these fabrics were produced and distributed within the regional boundaries of the central-south zone (*cf*. Webb and Frankel 2008).

The results of this research indicate that Philia ceramic uniformity resulted from the employment of a common recipe for the production of almost identical pottery across the island, but also from the existence of a large-scale distribution network that was mainly supported by a specific production centre or cluster of production centres on the north coast. The selective and persistent use of calcareous clays, rich in carbonates, may be perceived as a conscious technological choice, supporting primarily the functionality of the final products. This technological inclination, coupled with the restricted Philia stylistic and typological repertoire, could also be considered as a form of communication and have facilitated the exchange of information and fostered a sense of a common social and cultural identity among the widespread Philia communities (see also Webb and Frankel 2008; Frankel and Webb 2006; Webb and Frankel 1999).

Further questions arise when considering the social landscape during the Philia phase; what supported this two-fold network of interactions? And what sustained this need for the Philia communities to manifest their social and cultural linkages? And how does the widespread distribution of fabric I relate to this materialization of common identity among the Philia communities? The obvious answer is conceivably metals and the metals trade, the motivating factor that enabled all major changes observed during the Philia period, and that brought Cyprus to the threshold of the Bronze Age.

The proximity of the newly founded Philia sites, such as Marki, to the copper ore deposits of Cyprus, and the exceptional wealth of the Vasilia tombs, suggesting the presence of a major harbour settlement in the area, indicates that the exploitation of the copper resources and consequent metals trade played an important role in the island's internal economy and the sustainability of the Philia settlements (Stewart 1962). While the fundamental economic basis was essentially agrarian, encouraged by the introduction of cattle and its exploitation as a traction animal for ploughing and as a meat resource, mining and metalworking must have been also major economic activities during this period. The outstanding number of metal artefacts found in the tombs of Vasilia suggests that the settlement was active in "the accumulation, distribution and recycling of metals" (Webb *et al.* 2006, 279), and as Stewart first argued, Vasilia was possibly the principal, if not the only, Cypriot centre for the export of copper and trading of metals (Stewart 1962, 288-289; Webb *et al.* 2006, 279).

The presence of the broadly distributed fabric I could be, thus, considered in relation to the existence of an island-wide web of inter-linked Philia settlements that participated in, and was sustained by this strongly allied social configuration. Pottery of fabric I could be circulated among other products, including metals, from the north to the south, within this network of social interaction. The intensification of copper production and the development of local copper exchange networks could explain, on the other hand, the development of more regional and localised networks exemplified by the distribution of pottery made with local fabrics, as recorded both at Marki and Kissonerga during the Philia period. Moving a step further, considering the abandonment of the Philia settlement at Vasilia, and the replacement of the island-wide Philia koine by the EC regional tendancies, it can be argued that once this island-wide network of settlement interaction ceased to exist, and perhaps the major settlement that sustained it was finally abandoned, more regional systems became stronger, encouraging social linkages between neighbouring settlements, as observed in the following EC period.

V.3. A longitudinal study of ceramic technology at EC-MC Marki Alonia

Among the recorded Philia sites (Webb and Frankel 1999), Marki must have been a small settlement. However being at present the only excavated settlement on the island with successive Philia, EC and MC strata, it takes on a greater significance today than it actually had during its occupation (Frankel and Webb 2006a, 306). As the excavators of the site argue, small inland communities, such as Marki, were probably founded later than the settlements on the north coast and in the river valleys of Ovgos and Pedhieos (Frankel and Webb 2006a, 306).

During the EC and MC periods, settlement size and tomb construction indicate gradual population growth, which reaches a peak in the MC I period (Frankel and Webb 2007; Frankel and Webb 2001a, 120, Figure 5). Recorded settlement sites are mainly located in the inland interface between the Troodos foothills and the arable land of the surrounding valleys, and in close proximity to perennial water sources (Knapp 2008, 72; Swiny 1981: 80–1). While a more systematic exploitation of the island's copper resources had began in the Philia phase, EC-MC communities still relied on the cultivation of land and farming.

Among the recorded EC and MC settlements, there are only two investigated sites to be located in coastal areas, the wealthy cemeteries at Lapithos and Bellapais.

Even though there is only a handful of evidence supporting Cyprus' relations with other Mediterranean regions during this time, there seems little reason to doubt that Lapithos and Bellapais served as the island's gateways, supporting existing external relations (Knapp 2008, 73), taking over the role of Vasilia, which by this time was abandoned. Nevertheless, there is a need for new archaeological evidence in order to understand the extent of these external relations during EC and MC, as well as the role of these (and potentially other) coastal communities within and outside the island.

Within the island, the differentiation in wealth between the cemeteries of the north coast and those located in the central and southern parts of the island is suggestive of the coexistence of communities of differing size and modes of material production (see also Peltenburg 1996, 27). Even though the absence of settlement material prevents reconstructions of the organisation of these differing communities, it could be argued that similarly to the preceding Philia phase, these larger communities had the means and manpower to produce and distribute artefacts beyond their immediate environment, while other, smaller settlements, such as Marki, retained the role of consumers throughout their histories. With reference to material production and distribution during the EC and MC periods, this research focused on the main wares recorded at Marki, in order to define the technology employed for their production and how this changed during the lifespan of the settlement. Moreover, an attempt was made to address the extent and character of local production at the settlement in comparison to imported pottery, and consequently the social links of Marki with other communities and regions in Cyprus.

Figure V.1 depicts the chronological span of the various fabrics identified during this research, based on the chronological occurrence of fabrics coming from Marki's stratified contexts, corresponding to vessels from the settlement's successive occupational phases (see also **Table IV.7**). Combining typological and compositional characteristics of the samples made with each of the thirteen defined fabrics, there is adequate evidence to argue that fabrics II, IV, VI and VIII were locally made at Marki and were in use throughout the lifespan of the settlement. Fabrics I, III and V are mainly used in the Philia phase, even though their production persists in the EC period. The typological and compositional characteristics of fabrics I and V suggest that these fabrics were imported to Marki. All the other fabrics defined, namely VII, IX, X, XII and XIII, are found in later contexts from EC III onwards. Fabrics XI, XII and XIII were imported to the settlement as their distinct typological and/or compositional characteristics imply, while there is no adequate information to argue whether fabrics IX and X were locally produced at Marki or whether they were imported to the settlement from somewhere else.

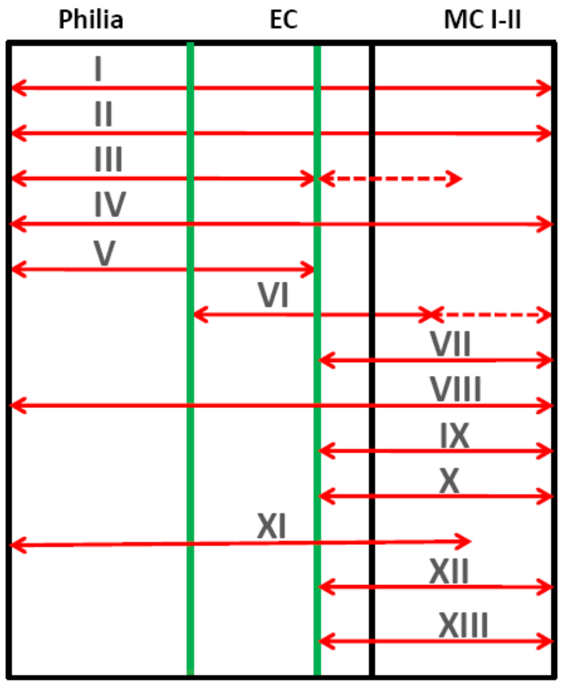
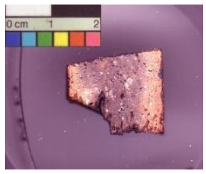
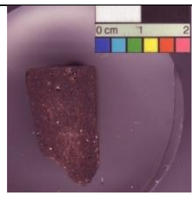


Figure V.1. All the fabrics identified in this research and their chronological span, according to the occupational phases in which the samples were recovered. See also **Table IV.7**.

Considering the overall chemical relations among the fabrics as defined by petrography (**Figure IV.50**), interestingly, the samples forming the largest fabric, namely Philia fabric I, also generate the tightest chemical cluster. The other two close chemical clusters correspond to the Philia type a cooking pot fabric V and ERS fabric XIII, both imported to the settlement, while a fourth cluster appears at the lower part of the scatterplot and involves samples allocated to fabric IV, which seems to be locally produced at Marki.

With these clusters in mind, it could be argued that the most comprehensible chemical groupings on the scatterplot involve fabrics which are imported to Marki. This could be the result of a more systematic exploitation of raw material resources and/or their more careful processing for the production of pottery intended for distribution; especially if this imported pottery fabric is reaching Marki from only one production centre. On the other hand, the compositional distinctiveness of fabric IV, being the only igneous fabric with such a high concentration of mica in its composition, differentiates it, both mineralogically and chemically, from all the other local and imported fabrics.

Fabric	Typological characteristics	Macroscopic characteristics of fabric	Useful figures for comparison
I	Thick slip layers, which do not follow systematically a specific hue or chroma, but which are all characterised by a medium to high lustre. Flat bases, which follow the same angle, attachment of flat or convex discs to the lower body of the vessels by drawing up clay from the interior and the exterior surfaces. They then pared or cut clay from the exterior to form the well-known angle characterising the RPP bases. Vertical, burnishing marks, an indication that burnishing on the external surfaces was conducted with a direction from rim to base and/or backwards. Incised decoration, uniform in terms of execution, light incisions, most of the times without white paste filler.	The fabric is relatively fine in texture and of a soft grade in hardness. The most common inclusions, visible in hand specimen, are greyish beige or white in colour and rounded in shape. More rarely some brown, also rounded, inclusions are visible. In addition, almost all of the samples are characterised by the presence of small voids evenly distributed across the cross-sections of the samples. With reference to fabric, the only significant distinction is the size of the greyish beige or white inclusions, which varies among samples. Most of the samples are not thoroughly oxidised during firing. The unoxidised areas most of the times cover two thirds of the vessels' inner surface, while oxidation is restricted to the areas close to the vessels' external surfaces.	Figure III.3 a-c, Figure III.4 a and c, Figure III.5. a-c, Figure III.7. a-b, Figure III.56 a-d  example in the photo – RPP KA-1
V	Philia cooking pots of Type a. Horizontal mouth with an everted thinning rim. There is no evidence for slip application on their surfaces and they are of a medium to hard scale in hardness	Hard fabric (3-4 on Moh's hardness scale), presence of dark brown cores in comparison to the lighter colours of the vessels' margins. presence of small white inclusions evenly distributed through the section of the samples; other greyish inclusions of a relatively larger size are also visible.	 example in the photo – RPC MA-10210
VIII	ECIII RPC, carbon coating on the exterior surface, "they are ovoid and relatively deep-bodied, have large openings and a low neck with flaring rim. The rim end is flattened" (Frankel and Webb 2006a, 135), wall thickness: 5-7 mm.	Medium to coarse in texture, and dark coloured, voids observed on vessels' surface and sections, white inclusions distributed across the section.	 example in the photo – RPC MA-11478

V.1. Combination of macroscopic information for identification of recorded fabrics

Ideally, one of the most important achievements of petrographic analysis would be the facilitation of rapid, macroscopic identification using the recorded characteristics of the smaller number of analysed samples clustered into fabric groups. Realistically, this is not always the feasible, as the macroscopic classification of pottery into fabric groups is not a straightforward task. However, a combination of stylistic and other macroscopic characteristics can be used to recognise some of the fabrics defined. **Table V.1** presents macroscopic information that can be used in combination for the identification or comparative study of some of the fabrics defined and documented during this research, with the aim to assist future studies.

The Marki sample indicates that EC is a period of continuous change. During EC I-II the Philia wares gradually stop to be produced and get replaced by EC pottery types. Moreover, it seems that EC III is an especially important stage during Marki's lifespan. During this time the presence of the fine fabric XIII is exclusively related to the production of ERS, while new fabrics are also developed for the production of already existing wares such as fabrics IX, X and VIII for the production of RP and RPC. Moreover, during this time, ceramic fabrics appear to be refined with more care than in earlier periods.

With reference to the technological changes observed in EC III, it is also worth mentioning the relative standardisation of RP III bowls made with fabric X. This relative standardisation is represented by the close similarities in shape, rim morphology and diameter, and wall thickness of these small bowls, as well as their compositional consistency in comparison with earlier and other contemporary RP bowls. In addition, this relative standardisation in the production of less-elaborate RP types indicates that during EC III, technological changes related to the more systematic use of raw materials and their thorough processing should not only be associated with production centres, such as those producing ERS and incised RP III, but rather a broader, island-wide technological shift in pottery production, including smaller production centres, such as that at Marki.

Another significant technological change occurring from EC III onwards is the decrease of reduced cores in the walls of the vessels. This decrease is associated with the firing atmospheres and in particular the control of oxygen flow during firing. The abundance of oxidised sections shows that the corresponding vessels were fired in oxidising atmospheres. Another factor contributing to the decrease of reduced areas is the aforementioned better processing of the fabrics and, particularly, the thorough removal of organic materials from the clays.

Fabrics II and IV cover a significant proportion of the pottery sample from Marki and a significant chronological extent of the settlement's lifespan, from Philia to EC III. The biotite mica-rich, non-calcareous fabric IV is used for the production of RPP, PRS, WPP, CW, RP, RPCP and RPC. Therefore, this fabric seems to be used for an extended range of wares, for the production of tableware, as well as more utilitarian shapes associated with cooking, food processing and storage, among them, Philia Type b cooking pots and RP Mottled.

Figure IV.107 shows that the same Philia fabrics were used for the production of RPP, PRS and WPP, and that subsequently the same fabrics were used for EC and MC RP and RPC. It seems that there was a broad, cross-ware use of the same fabrics throughout the Philia and EC-MC periods, and that most fabrics were used in making various wares. However, while a range of different fabrics was used for the production of RP pottery, cooking pots in the EC and MC periods are consistently made of coarse, non-calcareous, micaceous clays, rich in quartzitic inclusions. This supports existing arguments about the exploitation of specific types of clay when the vessel's effective performance required special properties, and the arbitrary use of both calcareous and non-calcareous clays when the clay properties did not affect effective use (c.f. Barlow 1996a; Barlow and Idziak 1989; Frankel and Webb 1996; Summerhayes *et al*. 1996).

Therefore, despite the absence of any one-to-one correspondence between wares and fabrics, there are examples of particularly suitable fabrics used for specific classes of pottery. For example, and in addition to the selective use of igneous fabrics for the production of EC-MC cooking pots, throughout the Philia and EC-MC periods, black-topped and incised pottery was made with fine, calcareous clays of soft grade in hardness. This exploits the physical properties of calcareous clays, and in particular their higher plasticity and softness in comparison to non-calcareous clays, as well as the greater density of organics present in calcareous clays coming from sedimentary environments that can facilitate the black-topped effect when part of the vessels are fired in a reducing atmosphere (Jones 1986). It should also be noted that fabrics used for the production of incised and black-topped pottery in EC-MC are not characterised by a heavy igneous component, like other contemporary fabrics, suggesting that most of these fabrics were imported to Marki from other, possibly northern communities outside the Troodos central-south zone.

It has already been argued that fabric XII does not represent vessels all made with the exact same fabric. It includes rather vessels that were made with similar techniques and belonged to the same, strong ceramic tradition. From EC III onwards, and within the wider RP III tradition, several production centres, mainly in the north, where the clays are more purely sedimentary in origin (Eccleston, et al forthcoming;

Courtois 1970; Jones 1986), produced elaborately incised pottery using the exact same techniques, and their local fine, calcareous clays. It seems likely that each production centre had its own preferences in incised motifs, and techniques of incision application (e.g. the example of Deneia: Frankel and Webb 2007; Webb 2010), which could be used as means for indicating origin and/or content. Among the RP III shape repertoire, small closed vessels, and in particular juglets, are distinguished by their stereotyped shape and decoration, and complex, *horror-vacui* decoration, which prompted Herscher to argue that these served as “recognisable trademarks” for their source/and or content.

The simple and coarse incisions on vessels RP-11359, RP-12361 and RP-15481 (**Figure IV.5.c-d**), indicate that these vessels belong to a different context of production and perhaps to a different ceramic tradition than the vessels made with fabric XII. The coarse texture and igneous nature of the fabrics used for these modestly incised vessels, as well as their coexistence in the same fabric with other utilitarian shapes, such as pans and mealing bins, are the strongest indications for the coexistence of different levels and contexts of production, when compared with the finely-decorated incised vessels made with fabric XII.

It seems that these differing levels and contexts of production existed from the very beginning of the Cypriot Bronze Age. It has been shown that already in the Philia phase, broader and more restricted systems of ceramic production and distribution coexisted, as indicated by the widespread presence of fabric I, in comparison with the other Philia fabrics. This multilevel nature of ceramic production continued in the EC and MC periods, as demonstrated by the presence of fabric IV at Marki, and then by a series of imported, finely incised RP vessels and ERS pottery.

While the networks of distribution and systems of material exchange changed significantly from the Philia to the EC and MC periods, Marki essentially maintained its role as a recipient in the subsequent networks of social and material interchange. The evident alluvial character of many of these artefacts, as well as the strong sedimentary character of hobs and loomweights, indicates that the potters did not travel far to obtain the necessary raw materials, but rather made use of the readily available, nearby Alykos riverbed deposits.

Ceramic production at Marki belonged to a more modest level of production, perhaps typical of most of the contemporary communities in Cyprus, which produced their own everyday ceramic utilitarian shapes and imported finer pottery from other communities. The Marki potters continued for several centuries to produce and use their own ceramics in order to satisfy the community's needs for everyday, domestic tasks. Somewhat more systematic attention was given only to those vessels, such as cooking pots, the efficient use of which required special fabric properties. The small but significant quantity of more exotic pottery imported to the settlement in all phases, bears witness to the community's continuous contacts and links with its adjoining world.

The potters at Marki were producing simple shapes suited for everyday domestic activities and other utilitarian tasks, and all local wares and shapes seem to display some irregularity either in composition or morphology. In terms of fabric, the locally produced fabrics seem to be made with materials selected from similar deposits, and do not present the homogeneity and compositional consistency that is displayed by other fabrics, imported to the settlement from other production centres.

Overall, this research has demonstrated the significance of pottery studies in understanding the ever-changing patterns of human interaction, especially in periods characterised by a paucity of archaeological evidence coming from domestic environments. This study has offered analytical justification to the argument that during the Phila phase a wide network of interaction extended across Cyprus, interconnecting various communities and regions, facilitating an island-wide system of social interaction and material exchange. It is in this context of island-wide social interaction that the typological and technological uniformity of RPP pottery should be understood. However, in this general cultural uniformity, regional interaction must have also been essential, linking neighbouring communities under the broader Philia cultural umbrella.

Regional distinctions became stronger once again in the EC I period, when Vasilia, one of, if not the principal large community sustaining the Philia island-wide network of material exchange and social interaction, was gradually, for still unknown reasons, abandoned. After the Philia phase and during the EC period, social interaction, at least at Marki, seems to extend primarily at a regional level.

It would not be groundless to say that during the early phases of EC, social contacts were restricted to Marki's immediate regional sphere of interaction, reflected in the dominant use of igneous fabrics, characterising the production of settlements in central and south Cyprus, within the Troodos circle of pillow lavas. While from EC III the bulk of the settlement's ceramic production is dominated by igneous materials, the importation of a more diverse variety of fabrics, both calcareous and non-calcareous, is suggestive an expansion of contact horizons to encompass more distant settlements in different directions, both to the north and south. It is important to note both the broader island-wide traditions, as well as the local preferences for specific shapes and styles, which "can unfold the types and degrees of contacts with other adjacent or more distant communities" (Frankel 1974a; 1988; 1991).

The outcome of this research agrees well with the study of the ceramic assemblages from nearby Alambra, and Sotira further to the south (Barlow 1996a; Herscher 2003; Vaughan 2003). These relatively small communities produced their own utilitarian shapes, collecting raw materials from their nearby rivers, alluvial clays from both sedimentary and igneous sources, or for slips, clays from igneous sources only (Barlow 1996a, 252). There is essentially a lack of standardisation in local production at all these sites, while the elaborately decorated, lustrous RP, whether incised and filled with white paste, whether decorated with plastic designs, whether black-topped or Black polished, almost always is made with a fine calcareous fabric and diminishes in numbers with distance from the possible centres of production in the northern and central parts of Cyprus and towards the south. Similarly to the situation at Marki, EC III is a turning point in the settlement history of Sotira, seeing the introduction of new pottery types and Drab Polished Blue Core ware (Herscher 2003, 194). However, wider contacts during EC III do not seem to intensify like at Marki (Herscher 2003, 194).

It seems that distance and topography are important factors affecting social relations throughout the EC and MC periods, and can be used to explain the overall restricted presence of incised decoration in Sotira, with the notable exceptions of RP South Coast ware (Swiny *et al.* 2003, 145). It seems that specific patterns of interaction were in place, with closer associations of nearer neighbours, rather than communities at considerable distances from each other (Frankel and Webb 2004; Frankel 1991).

At Marki, EC III is a period of technological and social expansion. Even though the closest links seem to be retained with neighbouring communities in the centre and south, as the predominance of igneous fabrics suggest, the presence of RP III incised and ERS suggest that ceramic imports from the north and the east reach the settlement, and that a broader social network is established (Frankel and Webb 2006a, 317). During this time, Marki reached its maximum expansion, and then underwent contraction in late MC I and MC II, before it was finally abandoned.

V.4. Prospects for future research

The ceramic study of the Marki assemblage raises additional questions about the existence of larger or more complex, differentiated communities in the Philia, EC and MC periods, as focal points of communication and interaction, the impact of metalworking and trade on social relations, and how all these evolved in time and contributed to the eventual emergence of the LC urban centres. GIS analysis, and in particular 'least-cost-path' analysis will be important in defining potential routes of interaction between settlements, based on the topography of the island and in relation to copper and other material resources, and to investigate whether these least-cost paths correspond to already defined relations between communities based on stylistic and technological similarities in pottery among them.

A collection of reference comparanda from the Cypriot geo-environment will be of key significance for understanding raw material exploitation patterns, as well as pinpointing the origin of the raw materials used in ceramic production, distinguishing local from imported end-products at a given archaeological site. Such a project[42] will fill a great gap by undertaking a multi-analytical investigation into the mineralogical, chemical and micro-paleontological characteristics of distinct geological regions of Cyprus for the creation of a broad databank, a powerful sourcing tool for future analyses of ancient pottery from Cyprus.

From a methodological point of view, it has been demonstrated that a combination of analytical techniques is more effective in defining compositional relationships between samples, and that each compositional method of analysis has its advantages but also restrictions. The large set of data obtained, combining different methodologies and the patterns identified to date, offer the opportunity for further testing against new methods of pottery analysis, such as nannofossil analysis[43] and

[42] A relevant research proposal for the creation of this kind of databank has been submitted for funding to the Cyprus Research Promotion Foundation.
[43] Fifty samples representing the main Philia, EC and MC fabrics identified within this research have already been studied for their micro-palaeontological characteristics by P. Quinn, and will be published soon in a separate piece of work.

portable XRF[44], and to assess the correspondence between their results, and the suitability and reliability of these methodologies in the study of ceramics.

Special research focus has already been set on cooking pots, as a functional class of pottery of which the effective function requires good knowledge of the raw materials and the end products mechanical and thermal properties. Thus, a research proposal was put forward for an island-wide diachronic study of the typo-chronological development of cooking pots, their technological evolution, their function in relation to cooking practices/traditions and food preferences.

This will essentially be a systematic and diachronic interdisciplinary study of cooking pot samples from the Cypriot Bronze Age to the Post-Medieval period. It should be noted that the challenging function of cooking vessels involving repeated heating and cooling, implies an often highly specialised production context and the production and use of standardised, well-tested types over long periods of time. As a result, cooking pots are cross-culturally restricted to small numbers of shapes; the low degree of typological variability allowing the realisation of a project, spanning such a large time-span.

This research project combines different scientific techniques, such as optical polarising microscopy and scanning electron microscopy for the compositional and micro-morphological study of the pots, in order to provide information regarding the selection of raw materials, how these were further processed or tempered, and what technical solutions past potters followed in order to enhance the vessels thermal shock resistance, strength and toughness, and thermal conductivity. This study will also provide a good prospect to test various hypotheses and technical arguments made by previous experimental and technical studies on actual archaeological material.

Moreover, the detection and quantification of organic compounds preserved within the ceramic matrices of samples from selected sites will supply us with information about food storage and food preparation amongst Cypriot societies in the past. Organic residue analysis will be employed in order to identify the types of foodstuffs once prepared in cooking pots and the determination of the specific function of shapes and cooking pot technologies under study. This combination of

[44] The pressed powder pellets prepared for ED-XRF analysis and the actual ceramic samples will be analysed with pXRF in the framework of the NARNIA research project. The new dataset will be compared with this thesis' datasets for testing the suitability and reliability of pXRF as an analytical method of ceramic analysis.

analytical techniques will allow a more cohesive and multidimensional study[45] of the Cypriot cooking vessel across time.

Placing the analytical datasets that derived from this project in the broader chronological sequence of pottery production and distribution, the physicochemical characterisation of RPP, RPCP, PRS and WPP provides the opportunity to compare this Philia ceramic sample with earlier, Late Chalcolithic pottery assemblages from Kissonerga and Lemba and assess their technological differences (or similarities). Considering arguments that Philia cultural attributes are already recognisable in the Late Chalcolithic, such a comparative technological study with pottery dated to the Late Chalcolithic strata immediately preceding Philia, will better define the technological spectrum of ceramic change within this transitional period.

According to Peltenburg (2007, 145) and Bolger (2007), the major pottery innovation during the Late Chalcolithic period is the shift from the patterned Red-on-White pottery to monochrome vessels, involving new production techniques associated with all the major stages of the production cycle from raw material selection and processing to vessel building and shaping, and firing. Therefore, a comparative technological assessment of these earlier Late Chalcolithic monochrome types and the RPP sample will be informative of the broader spectrum of cultural transformations as reflected in technological changes in ceramic production during the Late Chalcolithic/Philia transition. Late Chalcolithic and Philia pottery samples from the domestic assemblages of Kissonerga and Marki respectively, provide an excellent opportunity for the implementation of this kind of project using well-documented, contextualised settlement material.

In addition to the comparative technological study of the Philia ceramic sample with earlier ceramic typologies, this project encourages new research prospects for technological comparisons with pottery from neighbouring lands, claimed to have cultural similarities with the Philia material culture in Cyprus. As has been argued in Chapter I, crucial to the discussion of cultural change during the Late Chalcolithic/Philia transition are the strong similarities observed among pottery assemblages from western Anatolia and Cyprus. This new analytical characterisation

[45] This project has already been accepted for funding by the A. G. Leventis foundation and will officially commence in January 2012. This will be a research collaboration between the department of History and Archaeology, University of Cyprus and the Institute of Material Science, N.C.S.R. Demokritos.

of the technology of Philia pottery provides a basis for the development of a new research project to investigate these pronounced technological correlations, and consequently more accurately define the extent of social interactions that enabled cultural change during this time.

As has been many times stressed throughout this work, the lack of information about production loci and debris is a limiting factor affecting our understanding of the mode of ceramic production and the degree of craft specialisation. However, some comprehension of these issues can be possibly achieved if the EC-MC pottery sample from Marki is compared with pottery assemblages coming from LC I urban contexts, which clearly derive from a significantly different level of production. A compatible physicochemical and technological study of the main pottery wares, including utilitarian pottery like plain wares from an urban centre with LC I contexts, such as Enkomi, can provide a counterpart of specialised and perhaps centrally organised ceramic production, assessing how urbanisation affects pottery production and distribution.

Finally, the physicochemical study of ceramic samples from EC-MC Marki is only the beginning of what can be developed into a contextual study of ceramics from this settlement, and an investigation into intra-site production, consumption and import patterns, and if and how these change in time and space, during the lifespan of Marki. This fine-scale contextual study of pottery patterns consistent with the settlement's history of uninterrupted occupation may become a stepping stone in understanding similar processes at other contemporary sites across Cyprus, but currently only visible at Marki.

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APPENDICES

Appendix I

A collection of soil samples from the vicinity of Marki[46].

No	Location	Description
1	35°00"36N, 033°19"27E NW of Marki *Alonia*. Sample taken from a water irrigation bore hole.	Dark brown, silty, and sandy soil with traces of clay weathered product of lavas, and umberiferous material
2	34°59"43N, 033°20"00E River sediment from Kotsiatis dam. N of Analiontas village, S of Marki.	Light brown, uniform silty sand, loose, looks like alluvial deposit.
3	34°58"33N, 033°20"50E Mathiatis mine.	Bright brown coloured soil representing a mixture of silty, sandy soil and fragments of brownish, umberiferous shales.
4	34°59"38N, 033°17"29E Between the villages of Lythrodonta, Mathiatis, and Analionta.	Dark brown, umberiferous and manganiferous shales with inclusions of radiolarites.
5	34°59"38N, 033°17"29E Between the villages of Lythrodonta, Mathiatis, and Analionta (same point as no. 7).	Light yellowish siltstone and shale sequence probably representing the first sediments over the umberiferous shales and lavas.
6	35°00"26N, 033°18"24E W of Marki. Close to modern pottery production centre of Ayia Varvara.	Highly weathered (yellowish brown coloured) lava and mixtures of manganiferous shales.
7	35°01"39N, 033°18"13E W of Marki. 5 Km distance from *Alonia*.	Greenish grey silty marl representing the lower part of the cretaceous sediments that overlay the pillow lavas of Troodos ophiolite.
8	34°59"18N, 033°17"05E Direction from Analiontas towards Kapedes.	Brownish silty, sandy top soil with rock fragments. Probably represents agricultural soil over lava and umberiferous shale outcrops.
9	35°00"54N, 033°22"17E E of Marki.	Whitish/yellow reworked mixture of marl and chalky marl. Overall it is a dense silty, sandy soil.
10	35°01"41N, 033°22"36E Terrarosa? Close to Dhali.	Brownish red soil accumulation, over lava outcrops. It consists of weathered products of lavas reduced to silt-sand size with some clay and small size rock fragments.

[46] The description of soil samples was made by Dr. G. Petrides, Ex-director of the Department of Geological Surveys, Republic of Cyprus.

Appendix II
Accuracy and precision of the chemical analyses

II.1. Evaluation of the analytical accuracy of the ED-XRF method calculating the difference between analysed and certified values in the form of absolute (δ abs) and relative (δ rel, in %) errors. The arithmetic mean (μ) represents the analysed values of the different runs (n=number of runs).

		Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO
		%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SARM69	certified	0.82	1.92	14.91	68.98	0.29	2.03	2.45	0.80	0.03	0.03	0.13	7.44	37	70	60	87		75	133	38	379	601	85	16
SARM69	μ (n=27)	0.49	1.58	17.89	62.99	0.29	1.78	2.01	0.60	0.03	0.03	0.14	7.91	127	59	71	94	26	77	142	41	258	569	45	17
SARM69	δ abs	-0.32	-0.33	2.97	-5.99	0.00	-0.25	-0.44	-0.20	0.00	0.00	0.00	0.47	90	-10	12	7		2	9	3	-121	-32	-41	2
SARM69	δ rel (%)	-40	-17	20	-9	*0*	-12	-18	-25	-8	-5	3	6	244	-15	19	8		3	7	7	-32	-5	-48	11
BHVO-2	certified	2.21	7.20	13.44	49.66	0.27	0.52	11.35	2.72	0.06	0.04	0.17	12.24	57	150	158	127	29	11	457	33	231	145	47	
BHVO-2	μ (n=6)	2.64	4.99	16.80	49.34	0.20	0.46	10.03	2.07	0.05	0.04	0.18	13.06	179	128	175	128	31	9	471	33	137	145	19	
BHVO-2	δ abs	0.43	-2.21	3.37	-0.32	-0.07	-0.06	-1.32	-0.65	-0.01	0.00	0.02	0.82	122	-22	17	1	2	-2	14	0	-94	*0*	-28	
BHVO-2	δ rel (%)	19	-31	25	-1	-27	-12	-12	-24	-15	-12	9	7	215	-15	11	1	7	-17	3	2	-41	*0*	-59	
ECRM776	certified	0.49	0.48	29.42	63.06	0.06	2.93	0.31	1.63	0.00	0.02	0.00	1.44									402	1226		
ECRM776	μ (n=12)	0.57	0.44	32.57	60.01	0.06	2.60	0.28	1.38	0.04	0.03	0.01	1.76	32	41	36	93	67	218	219	53	294	1313	80	115
ECRM776	δ abs	0.08	-0.04	3.15	-3.04	-0.01	-0.33	-0.03	-0.25	0.04	0.00	0.01	0.32	32	41	36	93	67	218	219	53	-108	87	80	115
ECRM776	δ rel (%)	16	-8	11	-5	-10	-11	-9	-15		20		22									-27	7		
SRM-679	certified	0.19	1.36	22.65	56.69	0.19	3.18	0.24	1.05	0.00	0.02	0.24	14.09	36			202			94			527	141	
SRM-679	μ (n=12)	0.34	1.36	24.21	54.59	0.14	2.60	0.21	0.84	0.03	0.02	0.26	15.24	157	59	54	167	46	222	95	56	131	492	70	20
SRM-679	δ abs	0.15	-0.01	1.57	-2.10	-0.05	-0.57	-0.03	-0.21	0.03	0.00	0.02	1.16	121			-35			*0*			-35	-71	
SRM-679	δ rel (%)	78	-1	7	-4	-25	-18	-13	-20		-12	7	8	337			-17			*0*			-7	-50	

II.2. Evaluation of the analytical precision of the ED-XRF method calculating the standard deviation (σ) for each oxide after repeated runs of each sample and the coefficient of variation (CV, in %). The arithmetic mean (μ) represents the analysed values of the different runs (n=number of runs).

		Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO
		%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SARM69	certified	0.82	1.92	14.91	68.98	0.29	2.03	2.45	0.80	0.03	0.03	0.13	7.44	37	70	60	87		75	133	38	379	601	85	16
SARM69	μ (n=27)	0.49	1.58	17.89	62.99	0.29	1.78	2.01	0.60	0.03	0.03	0.14	7.91	127	59	71	94	26	77	142	41	258	569	45	17
SARM69	σ	0.24	0.07	0.37	0.23	0.00	0.02	0.06	0.01	0.00	0.00	0.01	0.32	17	6	4	4	2	4	7	2	16	34	7	1
SARM69	CV (%)	48	4	2	*0*	2	1	3	2	9	7	4	4	14	10	5	4	9	5	5	6	6	6	15	9
BHVO-2	certified	2.21	7.20	13.44	49.66	0.27	0.52	11.35	2.72	0.06	0.04	0.17	12.24	57	150	158	127	29	11	457	33	231	145	47	
BHVO-2	μ (n=6)	2.64	4.99	16.80	49.34	0.20	0.46	10.03	2.07	0.05	0.04	0.18	13.06	179	128	175	128	31	9	471	33	137	145	19	
BHVO-2	σ	0.21	0.07	0.08	0.27	0.01	0.00	0.05	0.01	0.00	0.00	0.00	0.17	17	4	6	2	3	0	7	0	6	8	4	
BHVO-2	CV (%)	8	1	*0*	1	3	1	1	1	4	5	2	1	10	3	4	2	9	2	1	1	5	5	19	
ECRM776	certified	0.49	0.48	29.42	63.06	0.06	2.93	0.31	1.63	0.00	0.02	0.00	1.44									402	1226		
ECRM776	μ (n=12)	0.57	0.44	32.57	60.01	0.06	2.60	0.28	1.38	0.04	0.03	0.01	1.76	32	41	36	93	67	218	219	53	294	1313	80	115
ECRM776	σ	0.38	0.06	0.27	0.36	0.01	0.04	0.00	0.01	0.00	0.00	0.00	0.03	5	2	2	2	3	2	2	1	11	41	5	2
ECRM776	CV (%)	67	14	1	1	14	1	2	1	8	6	7	2	16	6	5	2	4	1	1	2	4	3	6	2
SRM-679	certified	0.19	1.36	22.65	56.69	0.19	3.18	0.24	1.05	0.00	0.02	0.24	14.09	36			202			94			527	141	
SRM-679	μ (n=12)	0.34	1.36	24.21	54.59	0.14	2.60	0.21	0.84	0.03	0.02	0.26	15.24	157	59	54	167	46	222	95	56	131	492	70	20
SRM-679	σ	0.31	0.07	0.15	0.27	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.07	19	5	4	3	3	1	1	1	6	14	7	1
SRM-679	CV (%)	91	6	1	*0*	3	1	3	1	7	9	1	*0*	12	8	8	2	6	1	1	2	4	3	9	5

II.3. Evaluation of the analytical accuracy and precision of the SEM-EDS method calculating the absolute (δ abs) and relative (δ rel, in %) errors, the standard deviation (σ) for each oxide after repeated runs of each sample and the coefficient of variation (CV, in %). The arithmetic mean (μ) represents the analysed values of the different runs (n=number of runs).

USGS BHVO-2	Na_2O	MgO	A_2O_3	SiO_2	K_2O	CaO	TiO_2	Fe_2O_3
	1.7	6.5	12.7	53.0	0.6	11.8	2.8	9.8
	1.7	6.6	12.4	53.3	0.6	11.6	3.0	9.8
	1.8	6.8	12.5	53.1	0.5	11.7	2.9	10.7
	1.7	6.6	12.5	52.9	0.6	11.7	2.9	10.0
	1.6	6.5	12.4	53.2	0.6	11.7	2.9	11.1
cerified	2.2	7.2	13.5	49.9	0.5	11.4	2.7	12.3
μ (n: 5)	1.8	6.7	12.7	52.6	0.6	11.6	2.9	10.6
δ abs	0.4	0.6	0.8	-2.7	0.0	-0.2	-0.2	1.7
δ rel (%)	19.2	7.7	6.1	-5.4	-7.4	-2.1	-5.6	13.7
σ	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.6
CV (%)	4.7	1.6	1.0	0.3	3.7	0.5	1.9	5.7

Appendix III.1
The macroscopic study of the RPP sample[39]

Sample no.	RPP KA-1 (fabric I[40]) 
Ware	RPP
Context	Dikaios' trial trench.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Exterior 2.5YR 4/3 dusky red. Worn slip, no slip in the interior, medium lustre.
Degree of oxidation	Oxidised margins, unoxidised grey core.
Fabric/Hardness	Soft fabric, even distribution of voids, an infrequent number of red and grey colour inclusions.
Wall thickness	0.9 cm.

Sample no.	RPP KA-2 (fabric I) 
Ware	RPP
Context	Dikaios' trial trench.
Shape	Medium sized open shape, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Applied slip on both the exterior and interior surfaces. Worn slip 2.5YR 5/6 red, medium lustre.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Soft fabric, even distribution of voids, small pores on the exterior and interior surfaces, small number of white and grey inclusions.
Wall thickness	0.7 cm.

[39]The descriptions of the RPP samples from Marki are provided by D. Frankel and J.M. Webb (2006a).

[40] As defined by petrographic analysis.

Sample no.	RPP KA-3 (outlier) 
Ware	RPP- Black-topped
Context	Dikaios’ trial trench
Shape	SO- rim and body sherd – incurved, thinning, rounded rim.
Degree of preservation	Average.
Decoration – Interior/Exterior	10R 4/6 red slip on the exterior surface. Upper left half of rim blackened and all of the interior surface and core of the sherd. Slip applied on the exterior and interior. Interior surface blackened.
Degree of oxidation	Oxidised upper exterior surface, all the rest unoxidised.
Fabric/Hardness	Soft fabric voids distributed evenly all over the sherd. A very small number of white inclusions.
Wall thickness	0.6 cm.

	RPP KA-4 (fabric I) 
Ware	RPP – base and body sherd.
Context	Dikaios’ trial trench
Shape	LC - base
Degree of preservation	Average. Wear on the edge of base. Interior surface uneven.
Decoration – Interior/Exterior	Exterior medium lustre slip, no mottling, even burnishing.
Degree of oxidation	Oxidised exterior – unoxidised interior.
Fabric/Hardness	Soft fabric, voids and grey inclusions.
Wall thickness	Body 0.7 cm, Base: 0.3 cm.

Sample no.	RPP KA-5 (fabric I) 
Ware	RPP
Context	Dikaios' trial trench.
Shape	LC, body.
Degree of preservation	Average.
Decoration – Interior/Exterior	Exterior medium lustre 10R 5/6 red slip, no mottling, even burnishing – visible marks from burnishing, vertical to the surface of the vessel. No slip in the inside.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, voids, grey and white inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP KA-6 (fabric I) 
Ware	RPP
Context	Dikaios' trial trench
Shape	LC – jug – neck, cut-away mouth? Concave neck fragment.
Degree of preservation	Average. Worn slip.
Decoration – Interior/Exterior	Low lustre, worn 2.5YR 5/6 red slip, only on the exterior surface. Slip almost fade away from interior surface. Visible burnishing marks, vertical to the exterior surface.
Degree of oxidation	Oxidised interior and exterior. Very thin, unoxidised core.
Fabric/Hardness	Medium soft fabric, voids, white grey inclusions.
Wall thickness	0.7 cm.

Sample no.	RPP NAP-8 (fabric I) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	LC, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	High lustre, 10YR 4/6 red slip, even burnishing, burnishing marks. No slip on the inside.
Degree of oxidation	Oxidised. Thin layer of unoxidised interior surface, but oxidised core.
Fabric/Hardness	Soft fabric, very few voids, especially in comparison with the K.A. samples. Some white, large sized inclusions.
Wall thickness	0.8 cm.

Sample no.	RPP NAP-10 (fabric I) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	High lustre 10YR 4/6 red slip.
Degree of oxidation	Oxidised
Fabric/Hardness	Medium – soft, fine fabric, grey inclusions, no voids.
Wall thickness	0.9 cm.

Sample no.	RPP NAP-11 (fabric IV) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	SO, rim and body sherd. Incurved, thinning rounded rim.
Degree of preservation	Covered by post-depositional lime.
Decoration – Interior/Exterior	10YR 4/6 slip when visible from post-depositional lime. Black mottling close to rim. Black topped?
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium, soft fabric. White inclusions and few voids.
Wall thickness	Body 0.6 cm, Rim 0.4 cm.

Sample no.	RPP NAP-12 (fabric I) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	LC, body sherd.
Degree of preservation	Average, post-depositional lime.
Decoration – Interior/Exterior	Medium lustre, 2.5YR 5/6 red slip, no mottling, even burnishing, and no slip on interior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, large sized beige and reddish brown inclusions and voids.
Wall thickness	0.7 cm

Sample no.	RPP NAP-13 (fabric I) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	LC, rim sherd, cut-away mouthed jug.
Degree of preservation	Bad, covered in post-depositional lime.
Decoration – Interior/Exterior	When visible, medium lustre 2.5YR 4/6 dark red slip on both exterior and interior surfaces.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Medium, soft fabric. White and grey inclusions. Large voids.
Wall thickness	0.9 cm.

Sample no.	RPP NAP-16 (outlier) 
Ware	RPP
Context	Georgiou, tomb 27.
Shape	LC, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	High lustre, 2.5 YR 5/6 red slip only on exterior surface, even burnishing, no mottling.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Medium soft to hard fabric, fine texture, very limited presence of voids, no visible inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP NAP-17 (fabric I) 
Ware	RPP
Context	Stewart, tomb 103.
Shape	LC, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	Very high lustre 2.5YR 4/6 dark red slip only on exterior surface, even burnishing, no mottling. *!best slip lustre of all samples.
Degree of oxidation	Oxidised exterior and unoxidised interior.
Fabric/Hardness	Hard fabric, white and grey large inclusions, no voids.
Wall thickness	0.6 cm.

Sample no.	RPP VK-18 (fabric I) 
Ware	RPP
Context	Stewart, tomb 103.
Shape	LC, body sherd.
Degree of preservation	Average to bad.
Decoration – Interior/Exterior	Worn, matt 2.5 YR 5/6 red slip, only on the exterior surface. Even burnishing, no mottling.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Medium soft, some voids and few white inclusions.
Wall thickness	0.7 cm.

Sample no.	RPP VK-19 (fabric I) 
Ware	RPP
Context	Stewart, tomb 103.
Shape	LO, rim sherd. Thinning, round, straight rim.
Degree of preservation	Average, some post depositional lime.
Decoration – Interior/Exterior	Very high lustre, 5YR 5/6 yellowish red slip both on interior and exterior surfaces. Visible burnishing marks, parallel to the rim.
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium soft, fine texture fabric. A small number of voids and small grey inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP VK-20 (fabric I) 
Ware	RPP
Context	Stewart, tomb 103.
Shape	LO, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	Matt slip with lustrous striations as a result of irregular burnishing. Orientation of the burnishing marks different on exterior and interior surfaces; exterior parallel to the rim, interior vertical to the rim. 2.5 YR 5/6 red to 2.5YR 4/6 dark red slip.
Degree of oxidation	Oxidised margins, very thick grey core.
Fabric/Hardness	Soft fabric, small voids evenly distributed across the section, and white and grey inclusions.
Wall thickness	0.7 cm.

Sample no.	RPP VK-21 (fabric I) 
Ware	RPP
Context	Stewart, tomb 103.
Shape	LC, body sherd.
Degree of preservation	Bad, worn slip.
Decoration – Interior/Exterior	2.5 YR 4/6 dark red, medium lustre slip, even burnishing, no mottling. No slip on interior surface.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Soft fabric, big voids especially on interior surface and a lot of large sized white inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP PLK-22 (fabric I) 
Ware	RPP, black-topped.
Context	Dikaios, tomb 1.
Shape	LO, rim and body sherd. Incurved, thinning, round rim.
Degree of preservation	Average.
Decoration – Interior/Exterior	Black top extends 2 cm from the rim's edge to the centre of the vessel's surface. Irregular burnishing. 2.5YR 3/1 very dark grey and medium lustre 2.5 YR 4/4 dusky red slip. Visible irregular burnishing marks, vertical to the rim of the vessel. Inside black slip, 3/N3 very dark grey, and burnishing marks parallel to the rim.
Degree of oxidation	Exterior upper part, close to the rim unoxidised, lower part oxidised. Unoxidised interior.
Fabric/Hardness	Soft fabric with few voids and grey and white inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-23 (fabric I) 
Ware	RPP, Black topped.
Context	Dikaios, tomb 1.
Shape	LO, rim and body sherd. Incurved, thinning, round rim.
Degree of preservation	Average.
Decoration – Interior/Exterior	Black topped, medium lustre, no mottling, irregular burnishing 3/N3 very dark grey and 2.5 YR 4/4 dusky red. Interior black. Burnishing marks vertical to the rim edge on exterior surface. Black interior surface.
Degree of oxidation	Exterior upper part, close to the rim unoxidised, lower part oxidised. Unoxidised interior.
Fabric/Hardness	Soft, fine fabric.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-24 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, rim and body sherd. Horizontal, round, everted rim.
Degree of preservation	Average to bad.
Decoration – Interior/Exterior	Red slip, matt, 2.5YR 4/6 dark red applied on both exterior and interior surfaces. Incised decoration, six parallel zigzag lines, parallel to the rim. Shallow incisions with slip inside and traces of white filling.
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium-soft fabric, very few voids, and large number of black and white inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP PLK-25 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, jug, rim and neck, round, everted rim.
Degree of preservation	Bad.
Decoration – Interior/Exterior	Matt slip 2.5 YR 4/4 dusky red. Incised decoration below rim. Six parallel zigzag lines parallel to the rim. Slip in incisions and remains of white filling. Carelessly incised.
Degree of oxidation	Oxidised
Fabric/Hardness	Medium hard, white and grey inclusions.
Wall thickness	0.7 cm.

Sample no.	RPP PLK-26 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Average to bad.
Decoration – Interior/Exterior	Matt 2.5 YR 4/4 dusky red slip, seven incised parallel lines on the upper half of the sherd. Shallow incisions, white filling remains, carelessly executed.
Degree of oxidation	Oxidised
Fabric/Hardness	Soft fabric, white and grey inclusions.
Wall thickness	0.4 cm.

Sample no.	RPP PLK-27 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	SC, body sherd.
Degree of preservation	Bad.
Decoration – Interior/Exterior	Matt 2.5YR 4/4 dusky red slip. Two groups of four parallel shallow incised lines. Remains of white filling. Worn slip only on the exterior surface.
Degree of oxidation	Oxidised
Fabric/Hardness	Soft fabric, black, white and light brown inclusions.
Wall thickness	0.4 cm.

Sample no.	RPP PLK-28 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Irregular burnishing, evident vertical to the surface burnishing marks. 10R 4/4 weak red to 4/6 red slip, medium lustre, uneven inner surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, fine texture, white inclusions
Wall thickness	0.7 cm.

Sample no.	RPP PLK-29 (fabric I) 
Ware	RPP, Black topped.
Context	Dikaios, tomb 1.
Shape	SO, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Upper part 3/n3 very dark grey, lower part 2.5YR ¾ dusky red. Black interior. Interior surface parallel to the rim burnishing marks, outer surface vertical to the surface burnishing marks.
Degree of oxidation	Unoxidised upper half exterior and whole of the interior, and oxidised lower half exterior.
Fabric/Hardness	Soft fabric, small number of voids, some white and grey inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-31 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, rim and neck, horizontal, round, everted rim.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre, 2.5YR 4/8 dusky red slip. Visible burnishing marks, vertical to the surface, and parallel to the rim. Slip on both inside and outside surfaces.
Degree of oxidation	Oxidised.
Fabric/Hardness	Soft fabric, some voids and white and grey inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP PLK-33 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, base sherd.
Degree of preservation	Average. Wear on edge of the base.
Decoration – Interior/Exterior	Uneven burnishing, medium lustre 10R 4/6 red slip. Smoothing marks on the interior surface horizontal to the surface.
Degree of oxidation	Oxidised.
Fabric/Hardness	Soft fabric, very few voids and number of grey inclusions.
Wall thickness	Wall 1.2 cm, base 1.0 cm

Sample no.	RPP PLK-34 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, rim sherd. Horizontal, everted, round rim.
Degree of preservation	Average to bad.
Decoration – Interior/Exterior	Eight parallel zigzag lines below rim badly executed. Shallow incisions, slip and filling remains within. Matt 10R 4/8 red slip.
Degree of oxidation	Oxidised
Fabric/Hardness	Soft fabric, beige/reddish yellow clay, grey inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP PLK-35 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, base sherd.
Degree of preservation	Average, wear on the edge of the base.
Decoration – Interior/Exterior	Low lustre, 2.5YR 4/6 dark red slip. Burnishing marks, horizontal to the surface of the vessel. This sample differs from the rest of the PLKs.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Soft fabric, voids evenly distributed across section, some visible white inclusions
Wall thickness	Base 1.1 cm, wall 1.0 cm.

Sample no.	RPP PLK-37 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	SO, rim and body sherd. Round, thinning, incurved rim.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre, 10R 4/6 red slip on interior and exterior surfaces, visible horizontal burnishing marks on both interior and exterior.
Degree of oxidation	Oxidised.
Fabric/Hardness	Soft fabric, fine textured 5YR 6/6 reddish yellow clay, some voids, no visible inclusions in section.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-38 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre 10R 5/6 to 4/6 red slip, uneven burnishing, no slip on interior surface.
Degree of oxidation	Oxidised exterior, semi-unoxidised interior.
Fabric/Hardness	Soft fabric, a few voids, white and reddish brown inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-39 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, base and body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre 10R 4/6 red slip. Even burnishing. Burnishing marks horizontal on exterior surface, parallel to the base. Some mottling. No slip on interior surface.
Degree of oxidation	Unoxidised parts were mottling occurs and the rest oxidised.
Fabric/Hardness	Medium soft, some voids, large off-white and grey inclusions.
Wall thickness	Wall 0.8 cm, base 0.8 cm.

Sample no.	RPP PLK-40 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Bad, worn slip.
Decoration – Interior/Exterior	Medium lustre, 10R 4/6 red slip, much worn on exterior surface, uneven burnishing.
Degree of oxidation	Oxidised.
Fabric/Hardness	Soft fabric, 5YR 6/6 reddish yellow clay, some voids, white and grey inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-41 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body and base sherd.
Degree of preservation	Bad, no preserved slip.
Decoration – Interior/Exterior	No slip preservation.
Degree of oxidation	Oxidised margins, semi-oxidised core.
Fabric/Hardness	Soft, 5YR 6/6 reddish yellow clay, some voids and grey inclusions.
Wall thickness	0.5 cm.

Sample no.	RPP PLK-42 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Bad.
Decoration – Interior/Exterior	Medium lustre, evenly burnished, 2.5YR 4/6 dark red slip, only on exterior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior
Fabric/Hardness	Soft, porous fabric.
Wall thickness	0.6 cm.

Sample no.	RPP PLK-43 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre, 2.5YR 4/6 dark red slip, evenly burnished. No slip on interior surface.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Medium hard, porous fabric.
Wall thickness	1.2 cm.

Sample no.	RPP PLK-44 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Medium lustre, 2.5YR 4/6 dark red slip. Uneven burnishing, no slip on the interior.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Medium soft, some voids, and white inclusions.
Wall thickness	1 cm.

Sample no.	RPP PLK-45 (fabric I) 
Ware	RPP
Context	Dikaios, tomb 1.
Shape	LC, body sherd.
Degree of preservation	Bad, worn slip.
Decoration – Interior/Exterior	Evenly burnished, matt 2.5 YR 4/4 dusky red slip, only on exterior surface.
Degree of oxidation	Oxidised exterior ,unoxidised inerior.
Fabric/Hardness	Soft fabric, 5YR 6/6 reddish yellow clay, some voids, off-white, grey, and reddish brown inclusions.
Wall thickness	1.0 cm.

Sample no.	RPP PV-46 (fabric I) 
Ware	RPP
Context	Stewart, tomb 3.
Shape	LC, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	Even burnishing, high lustre, 10R 4/6 red slip only on exterior surface. Some mottling.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Medium soft, off-white and reddish brown inclusions, limited number of voids.
Wall thickness	0.5 cm.

Sample no.	RPP PV-47 (fabric I) 
Ware	RPP
Context	Stewart, tomb 3.
Shape	LC, body sherd.
Degree of preservation	Average to good.
Decoration – Interior/Exterior	Even burnishing, high lustre, 10R 4/6 red slip only on exterior surface. Some mottling.
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium soft, off-white and reddish brown inclusions, limited number of voids. Very similar to Ph.46, also from PV.
Wall thickness	0.4 cm.

Sample no.	RPP PV-49 (fabric I) 
Ware	RPP
Context	Stewart, tomb 3.
Shape	LC, body and shoulder.
Degree of preservation	Average
Decoration – Interior/Exterior	High lustre, 10R 4/6 red slip, even burnishing, very little mottling, only one exterior surface. Burnishing marks vertical to shoulder and wall of vessel.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Medium soft fabric, 5YR 6/6 reddish yellow, no voids, and some reddish brown, white and grey inclusions, very small in size.
Wall thickness	0.4 cm.

Sample no.	RPP PV-50 (fabric I) 
Ware	RPP
Context	Stewart, tomb 3.
Shape	LC, body sherd.
Degree of preservation	Average to bad, worn slip.
Decoration – Interior/Exterior	Medium lustre, 10R 4/6 red slip, even burnished, only on exterior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, some voids, a few grey inclusions.
Wall thickness	0.6 cm.

Sample no.	RPP KM-51 (fabric I) 
Ware	RP
Context	Peltenburg, unit 2048.
Shape	LC, body sherd.
Degree of preservation	Average to bad, covered with post depositional lime.
Decoration – Interior/Exterior	Even burnishing, medium lustre, 10R 4/6 red slip, only on exterior surface. Uneven interior surface, finger impression?
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium soft, fine fabric, 10YR 7/4 very pale brown clay.
Wall thickness	0.6 cm.

Sample no.	RPP KM-52 (fabric I) 
Ware	RP
Context	Peltenburg, unit 2048
Shape	LC, body sherd.
Degree of preservation	Average to bad, post-depositional lime.
Decoration – Interior/Exterior	Medium lustre 10R 4/8 red slip, even burnishing.
Degree of oxidation	Oxidised.
Fabric/Hardness	Medium soft, fine textured 10YR 7/4 very pale brown clay.
Wall thickness	0.6 cm.

Sample no.	RPP KM-53 (fabric I) 
Ware	RPP
Context	Peltenburg, unit 68
Shape	LC, body sherd.
Degree of preservation	Average to bad – worn slip.
Decoration – Interior/Exterior	Uneven burnishing, medium lustre 10R 4/6 red slip, no slip on interior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, even distribution of voids parallel to the margins, no visible inclusions in section.
Wall thickness	0.7 cm.

Sample no.	RPP KM-54 (fabric I) 
Ware	RPP
Context	Peltenburg, unit 66.
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Uneven burnishing, medium lustre 5 YR 4/6 yellowish red slip, no slip on interior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, even distribution of voids parallel to the margins, no visible inclusions in section.
Wall thickness	0.8 cm.

Sample no.	RPP KM-55 (fabric I) 
Ware	RP
Context	Peltenburg, unit 886
Shape	LC, body sherd.
Degree of preservation	Average.
Decoration – Interior/Exterior	Even burnishing, 10R 4/6 red slip, no slip on interior.
Degree of oxidation	Oxidised margins, unoxidised core.
Fabric/Hardness	Medium soft, fine fabric. Some voids, no visible inclusions in section.
Wall thickness	1.1 cm.

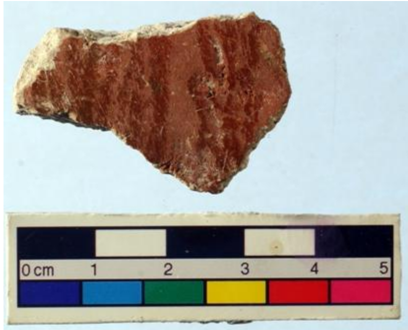
Sample no.	RPP KM-56 (fabric I) 
Ware	RPP
Context	Peltenburg, unit 886
Shape	LC, body sherd.
Degree of preservation	Average to bad, post-depositional lime.
Decoration – Interior/Exterior	10R 5/6 red medium lustre slip only on exterior surface, even burnishing.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Medium soft, fine fabric.
Wall thickness	0.6 cm.

Sample no.	RPP KS-57 (fabric I) 
Ware	RPP
Context	Crewe, unit 76?
Shape	LC, body sherd
Degree of preservation	Average.
Decoration – Interior/Exterior	High lustrous, Uneven burnishing, 10R 4/6 red slip, no slip on interior surface.
Degree of oxidation	Oxidised exterior, unoxidised interior.
Fabric/Hardness	Soft fabric, big number of large sized off-white, brown, reddish brown and grey inclusions. Very few voids.
Wall thickness	0.7 cm.

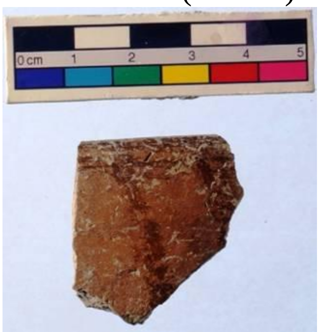
Sample no.	RPP MA-3570 (fabric I) 
Ware	RPP
Context	370, XX-2, Phase F
Shape	small closed, neck
Degree of preservation	<1/3 preserved
Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6-2.5YR4/8. Horizontal six-line zigzag or chevron. Broad incision with white in-fill and ragged edges. Slip in incision
Degree of oxidation	
Fabric/Hardness	medium-soft, very fine texture; few small white inclusions; thick, dark core. 7.5YR5/4
Wall thickness	body 0.7 cm.

Sample no.	RPP MA-4258 (fabric III)  .
Ware	RPP
Context	Context 469, XXXI-1, Phase H-1.
Shape	rim, small open, <1/3 preserved. 2 fragments. straight, constant, rounded rim. RimD: general 100-
Degree of preservation	Both sherds broken at thickening to handle join.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, ? lustre, no mottling, irregular burnishing. *Interior*: medium slip, medium lustre, no mottling, 5YR5/4-7.5YR4/4.
Fabric	medium-soft, medium texture; few small black and white inclusions; thick, light core. 7.5YR5/4
Wall thickness	rim 0.6 cm, body 1.1 cm.

Sample no.	RPP MA-5094 (fabric IV) 
Ware	RPP
Context	Context 392, XII-4, Phase F.
Shape	body, small open
Degree of preservation	<1/3 preserved, Interior very worn
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, band burnishing, 10YR6/3-10YR3/1. *Interior*: medium slip, medium lustre, no mottling, 2.5YR2.5/0. Interior with evenly polished black slip. Exterior has widely-spaced regular burnished bands of dark brown to greenish-black on a pink-grey background. Bands vary from 0.5 to 3.2mm wide and are spaced 2.5 to 4mm apart.
Fabric	medium-hard, medium texture; few small white inclusions, no core. 7.5YR3/2
Wall thickness	body 0.8 cm.

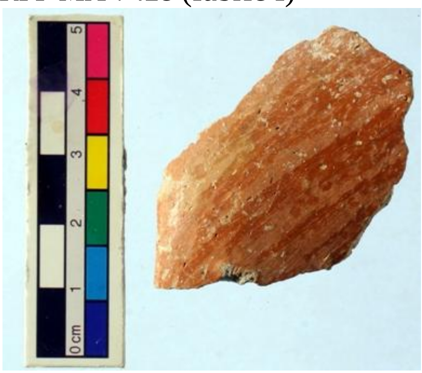
Sample no.	RPP MA-5096 (fabric II) 
Ware	RPP
Context	Context 302, XX - unstratified
Shape	body, small open
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, irregular burnishing, 2.5YR5/4-2.5YR4/4. *Interior*: medium slip, medium lustre, no mottling, 5YR5/3-5YR3/3. Interior and exterior both stroke burnished. Burnishing on exterior is fairy irregular, vertical and dark red (2.5YR4/4). Strokes on pale pink-red ground (2.5YR5/4), 1.5-2mm wide and 1.7-3.8mm apart. Interior strokes irregular, dark brown over light brown, in same direction as exterior and 1.2-2.5mm wide and 1-2.8mm apart.
Fabric	medium-soft, medium texture. Medium number of small + medium black and white inclusions, no core. 10YR6/4
Wall thickness	body 0.8 cm.

Sample no.	RPP MA-5104 (fabric II) 
Ware	RPP
Context	Context 306, XX-2, Phase F.
Shape	body, large closed
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, irregular burnishing, 5YR5/2.5YR3/3. Core on inner wall, greeny-grey in colour. Burnishing strokes thin, irregular and horizontal (5YR3/3 on matt ground 5YR5/2). They average 0.8 to 1mm wide and vary from 0.5 to 3mm apart.
Fabric	medium-soft, fine texture. Medium number of small black and white inclusions; thick, light core. 10YR6/4
Wall thickness	body 0.9 cm Sherd thickens toward one end

Sample no.	RPP MA-7229 (fabric I) 
Ware	RPP
Context	Context 809, L-2, Phase G.
Shape	rim, small open, incurved, thinning, rounded rim. RimD: general 100-200
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, band burnishing, 2.5YR3/3. *Interior*: medium slip, medium lustre, no mottling, 2.5YR3/2. *Fabric*: medium-soft, very fine texture; few small + medium + large black, red and white inclusions. 10YR4/4 Both surfaces very worn. Interior evenly burnished (direction not visible). On exterior horizontal burnished band at rim and widely-spaced oblique vertical bands below. Unburnished areas have lost their slip so slip colours refer to burnished areas. Width of bands approx 3-4mm
Fabric	Very fine to fine fabric with some large soft red inclusions.
Wall thickness	rim 0.2 cm, below rim 0.3 cm, body 0.5 cm.

Sample no.	RPP MA-7412 (outlier) 
Ware	RPP
Context	Context 982, L-11, Phase B-1.
Shape	rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 5YR5/6-2.5YR2.5/0. *Interior*: medium slip, high lustre, no mottling, 2.5YR2.5/0. Regular burnishing with full coverage of surface. Black top and interior.
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 10YR7/4
Wall thickness	rim 0.2 cm, below rim 0.3 cm, body 0.8 cm.

Sample no.	RPP MA-7427 (fabric IV) 
Ware	RPP
Context	jug rim, large closed cut-away mouth. From broad shallow beaked spout
Shape	Context 982, L-11, Phase B-1.
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, ? lustre, no mottling.
Fabric	medium-hard, medium texture; few small black, red and white inclusions; thick, dark core. 10YR6/4-6/6 Relatively crude manufacture. Very thick dark core occupies most of section.

Sample no.	RPP MA-7428 (fabric I) 
Ware	RPP
Context	Context 982, L-11, Phase B-1.
Shape	Jug, rim, large closed cut-away mouth.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, irregular burnishing, 2.5YR5/6-2.5YR4/6.
Fabric	medium-soft, fine texture. Medium number of small + medium black, red and white inclusions; thick, dark core. 7.5YR6/6

Sample no.	RPP MA-8789 (fabric I) 
Ware	RPP
Context	Context 1214, LXII-8, Phase D.
Shape	bowl. rim, large open, incurved, thinning, rounded rim. RimD: general 200-300.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, irregular burnishing, 2.5YR4/6-2.5YR2.5/0. *Interior*: medium slip, medium lustre, no mottling, 2.5YR4/8. Interior worn but probably evenly burnished horizontally. Exterior neatly burnished obliquely, but not covering whole surface. Individual burnish lines visible. Top 30mm of exterior black.
Fabric	medium-soft, fine texture. Medium number of small + medium + large black and white inclusions. thick, dark core. 7.5YR5/6 Some chopped straw (one rod 15 long) in clay. Very thick core, leaving thin layer of oxidised fabric on interior and exterior walls.
Wall thickness	rim 0.4 cm, below rim 0.5 cm, body 1.1 cm.

Sample no.	RPP MA-8962 (fabric I)  
Ware	RPP Differentially fired RPP
Context	1211, LXV-7, Phase C.
Shape	body or neck, large closed
Degree of preservation	<1/3 preserved
Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, even burnishing, 2.5YR2.5/0. *Decoration*: incised. fine incision.
Fabric/Hardness	*Fabric*: medium-soft, very fine texture; few small + medium black and white inclusions, no core. 10YR3/1
Wall thickness	body 0.6 cm.

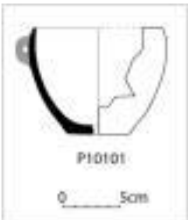
Sample no.	RPP MA-9117 (fabric II) 
Ware	RPP-Probably RPP with worn slip.
Context	Context 1326, LXIII-4, Phase C.
Shape	body, large closed,
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: worn slip, ? lustre, no mottling, 10YR6/3.
Fabric	Fabric: medium-soft, very fine texture; few small black and white inclusions; thick, dark core. 10YR6/4
Wall thickness	body 0.5 cm.

Sample no.	RPP MA-9369 (fabric I) 
Ware	RPP
Context	Context 1404, LX-14, Phase A.
Shape	bowl. body, small open
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, band burnishing, 2.5YR5/6. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0. Bands on exterior not parallel and approximately 10mm wide. Glossy black interior
Fabric	medium-soft, fine texture. Medium number of small black and white inclusions; thin, dark core. 10YR6/4
Wall thickness	body 0.8 cm.

Sample no.	RPP MA-9398 (outlier) 
Ware	RPP.
Context	Context 1391, LX - 13, Phase B-1.
Shape	body, large closed
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 5YR4/6. Decoration: incised.
Fabric	medium-soft, fine texture; few small black inclusions, no core. 10YR5/6
Wall thickness	body 0.7 cm.

Sample no.	RPP MA-9496 (fabric I) 
Ware	RPP
Context	Context 1418, LX-14, Phase A.
Shape	bowl. rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, band burnishing, 2.5YR2.5/0. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0. On exterior horizontal band around rim and oblique vertical bands below. On interior more irregular horizontal and angled burnishing. Black top and interior.
Fabric	medium-soft, fine texture. Medium number of small + medium red and white inclusions, no core. 10YR3/2
Wall thickness	rim 0.2 cm, below rim 0.4 cm, body 0.5 cm.

Sample no.	RPP MA-9999 (fabric I) 
Ware	RPP
Context	Context 1482, IX-14, Phase A.
Shape	jug cut-away mouth. low vertical, round handle, from rim. concave neck.
Degree of preservation	<1/3 preserved (small fragment) (???joined fragment???)
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, irregular burnishing, 7.5YR3/2-2.5YR4/6. Vertically burnished on neck. Individual strokes visible. Very lustrous. Fine quality vessel. Surface colour ranges from dark brown to red-brown.
Fabric	medium-soft, fine texture; few small + medium + large black and white inclusions. thick, dark core. 10YR5/4
Wall thickness	body 8 cm.

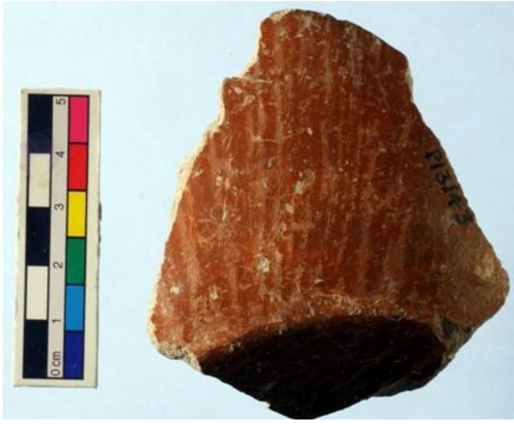
Sample no.	RPP MA-10101 (fabric IV) 
Ware	RPP – very fine vessel
Context	Context 1534, XIII-13, Phase B.
Shape	bowl small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 180
Degree of preservation	>1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, ? lustre, no mottling, 2.5YR5/6-2.5YR2.5/0. *Interior*: worn slip, ? lustre, no mottling, 2.5YR2.5/0. All black interior and for 32mm in straight line below rim on exterior. Surfaces very worn and lustre not preserved. Probably a very fine vessel. Large pierced lug or small loop set 30mm below rim.
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 10YR5/4
Wall thickness	rim 0.3 cm, below rim 0.5 cm, body 0.7 cm.

Sample no.	RPP MA-12213 (fabric III) 
Ware	RPP
Context	Context 1898, CI-6, Phase D.
Shape	Bowl, rim, large open, straight, thinning, rounded rim.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. Interior: medium slip, high lustre, no mottling, 5YR4/4. Black band at rim on interior and exterior (W 10mm on exterior; 6mm on interior). Deep bowl. RimD: general 200-300, specific 200.
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 10YR4/3
Wall thickness	rim 0.5 cm, below rim 0.7 cm, body 1.0 cm.

Sample no.	RPP MA-12371 (fabric II) 
Ware	RPP
Context	Context 1931, CV-3, Phase C-1.
Shape	rim+neck, large closed, horizontal, round mouth. Straight, thinning, rounded rim. upward tapering neck. RimD: general 100-200, specific 190.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, irregular burnishing, 5YR4/6. Slipped and burnished for 30mm down neck interior. Very sketchily burnished on exterior with thin, mainly slightly diagonal (almost vertical) strokes except at rim where burnishing is horizontal. Coverage only about 50%.
Fabric	medium-hard, medium texture; few small + medium black, red and white inclusions; thick, dark core. 5YR4/4 Fabric hard with many white inclusions, similar to RPCP
Wall thickness	rim 0.3 cm, below rim 0.4 cm, body 1.4 cm.

Sample no.	RPP MA-13067 (fabric I) 
Ware	RPP
Context	Context 2182, XCVIII-10, Phase C-1.
Shape	base, large closed, flat base.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, slight lustre, no mottling, irregular burnishing, 2.5YR4/6. Burnishing appears to be irregular. Wear at edge of base
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 10YR5/4
Wall thickness	body 1.2 cm, base 1.0 cm.

Sample no.	RPP MA-13085 (fabric II) 
Ware	RPP
Context	2140, CVI-1
Shape	bowl small open,. flat base.
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, band burnishing, 2.5YR4/6. *Interior*: medium slip, high lustre, no mottling, 2.5YR2.5/0. Glossy black interior
Fabric	*Fabric*: medium-soft, fine texture; few small + medium black and white inclusions; thick, dark core. 10YR6/4

Sample no.	RPP MA-13143 (fabric I) 
Ware	RPP
Context	Context 2250, XCVIII-12, Phase A.
Shape	base, large closed, flat base.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, irregular burnishing, 2.5YR4/6. Burnished vertically on body and at an angle on the base.
Fabric	medium-soft, medium texture. Medium number of small + medium black and white inclusions; thick, light core. 10YR5/4
Wall thickness	body 0.9 cm, base 0.9 cm.

Sample no.	RPP MA-14228 (fabric I) 
Ware	RPP
Context	2457, XCVI-8, Phase E
Shape	flat base, large closed
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. Edge of base heavily worn. Fired medium-soft to medium-hard
Fabric	*Fabric*: medium-soft, medium texture. Medium number of small + medium + large black and white inclusions. thick, dark core. 10YR5/4
Wall thickness	body 1.2 cm, base 1.2 cm.

Sample no.	RPP MA-14279 (fabric III) 
Ware	RPP
Context	Context 2535, XC-10, Phase C.
Shape	Bowl, base, large open, flat base.
Degree of preservation	<1/3 preserved. Base slip worn
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, irregular burnishing, 5YR5/6. *Interior*: worn slip, ? lustre, no mottling, 2.5YR4/6.
Fabric	medium-soft, medium texture. Medium number of small + medium black, red and white inclusions; thick, dark core. 10YR6/4
Wall thickness	body 0.8 cm, base 1.2 cm.

Sample no.	RPP MA-14361 (fabric I) 
Ware	RPP
Context	Context 2606, XCVI-12, Phase B.
Shape	rim, large closed, horizontal, round mouth. Flaring, constant, rounded rim. widening neck. RimD: general 100-200, specific 120.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6.
Fabric	medium-soft, fine texture. Medium number of small black, red and white inclusions, no core. 10YR5/4
Wall thickness	rim 0.3 cm, below rim 0.5 cm, body 0.6 cm.

Sample no.	RPP MA-14370 (fabric I) 
Ware	RPP
Context	Context 2606, XCVI-12, Phase B.
Shape	base, large closed, <1/3 preserved. flat base.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, even burnishing, 5YR5/6.
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 10YR5/4
Wall thickness	body 10, base 14 cm.

Sample no.	RPP MA-15309 (fabric III) 
Ware	RPP
Context	Context 2724, CVI-10, Phase B.
Shape	Bowl, rim+body, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 120.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, irregular burnishing, 2.5YR2.5/0-7.5YR4/4. Interior: medium slip, medium lustre, no mottling, 2.5YR2.5/0. Glossy black slip on exterior, extending approx 49 from rim. Glossy black interior.
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 10YR5/3
Wall thickness	rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	RPP MA-15316 (fabric I) 
Ware	RPP
Context	Context 2724, CVI-10, Phase B.
Shape	body, large closed
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. Decoration: incised. Incised motif 2, fine incision. Two shallow parallel horizontal lines, as preserved. Grey interior.
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 10YR5/4
Wall thickness	body 0.6 cm.

Sample no.	RPP MA-15337 (fabric I) 
Ware	RPP
Context	Context 2827, CVI-10, Phase B.
Shape	Bowl. rim+body, small open, RimD: general 100-200.
Degree of preservation	<1/3 preserved. incurved, thinning, rounded rim.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. Interior: medium slip, high lustre, no mottling, 2.5YR4/6. Slip worn on inner margin of rim.
Fabric	medium-soft, fine texture. Medium number of small black, red and white inclusions, no core. 10YR5/4
Wall thickness	rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	RPP MA-15461 (outlier) 
Ware	RPP
Context	Context 2797, CXIV-2, Phase F.
Shape	Bowl. rim, small open, incurved, thinning, rounded rim.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, irregular burnishing, 5YR5/6. Interior: medium slip, high lustre, no mottling, 7.5YR5/4-2.5YR2.5/0. RimD: general 100-200. On interior glossy black slip starting approx 11 below rim. Slip partly worn on rim.
Fabric	medium-soft, fine texture; few small black and white inclusions, no core. 10YR7/4
Wall thickness	rim 0.2 cm, below rim 0.3 cm, body 0.7 cm.
Sample no.	RPP MA-16408 (fabric II) 
Ware	RPP
Context	Context 3147, CX-9, Phase C.
Shape	Bowl. rim+body, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 140.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, medium lustre, no mottling, band burnishing, 5YR5/6. *Interior*: medium slip, medium lustre, no mottling, 5YR4/3-2.5YR2.5/0. Burnish not as lustrous as usual. Possibly worn. Horizontal burnished band at rim, above vertical bands. Some grey inclusions. Fabric texture fine to medium.
Fabric	medium-soft, fine texture. Medium number of small black and white inclusions; thick, dark core. 10YR7/3
Wall thickness	rim 0.4 cm, below rim 0.6 cm, body 1.0 cm.

Sample no.	RPP MA-16438 (fabric I) 
Ware	RPP
Context	Context 3033, CXVI-8, Phase C.
Shape	body, large closed,
Degree of preservation	<1/3 preserved
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. *Decoration*: fine incision. No trace of in-fill. Interior dark grey.
Fabric	medium-soft, fine texture; few small black and white inclusions; thin, dark core. 10YR6/4
Wall thickness	body 0.6 cm.

Sample no.	RPP MA-16444 (fabric I) 
Ware	RPP
Context	Context 3088, CXVI-8, Phase C.
Shape	Jug. rim, large closed, cut-away mouth.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6-2.5YR4/8. Lustrous slip on interior.
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 10YR6/4
Wall thickness	rim 0.2 cm, below rim 0.3 cm.

Sample no.	RPP MA-16452 (outlier) 
Ware	RPP
Context	Context 3033, CXVI-8, Phase C.
Shape	Jug, cut-away mouth.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, high lustre, no mottling, even burnishing, 2.5YR4/4-2.5YR4/6.
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 10YR6/4. *Decoration*: incised. Fine incision.
Wall thickness	Body 1.0 cm.

Sample no.	RPP MA-16480 (fabric II) 
Ware	RPP
Context	Context 3035, CXVI-8, Phase C.
Shape	Bowl. rim, large open, incurved, thinning, rounded rim. RimD: general 200-300.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/4. *Interior*: worn slip, high lustre, no mottling, 2.5YR4/4-2.5YR5/6.
Fabric	medium-hard, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 7.5YR4/4. Uneven surface. Some medium-sized grey inclusions.
Wall thickness	Rim 0.3 cm, below rim 0.4 cm, body 0.9 cm.

Sample no.	RPP MA-16486 (fabric I) 
Ware	RPP
Context	Context 3035, CXVI-8, Phase C.
Shape	Jar. rim+neck, large closed, horizontal, round mouth. Flaring, constant, rounded rim. Possibly from a 'mosque amphora'. RimD: general 100-200, specific 140.
Degree of preservation	<1/3 preserved. 2 fragments.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/4-2.5YR4/6. *Decoration*: fine incision. Lustrous slip on interior of rim. Two angled parallel lines, part of an unidentifiable motif.
Fabric	medium-soft, fine texture; few small black and white inclusions; thin, light core. 10YR6/4-5/4

Sample no.	RPP MA-16511 (fabric I) 
Ware	RPP
Context	Context 3179, CXXI-7, Phase C.
Shape	Bowl. body+base, small open, flat base. RimD: general 100-200.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, band burnishing, 2.5YR4/6. *Interior*: medium slip, high lustre, no mottling, 2.5YR2.5/0. Wear on edge of base. Glossy black interior, evenly burnished. Some brown inclusions. On exterior vertical band burnishing
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thin, dark core. 10YR6/4
Wall thickness	body 0.6 cm, base 0.8 cm.

Sample no.	RPP MA-16530 (fabric II) 
Ware	RPP
Context	Context 3159, XCIII-13, Phase A.
Shape	Bowl. rim+body, small open, incurved, thinning, flattened rim. RimD: general 100-200, specific 150. Deep bowl with flat rim.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. *Interior*: medium slip, high lustre, distinct mottling, 2.5YR4/4-2.5YR4/6.
Fabric	medium-soft, medium texture. Medium number of small white inclusions; thick, dark core. 10YR5/3 Some grey inclusions.

Sample no.	RPP MA-16733 (fabric I) 
Ware	RPP
Context	Context 3269, XCV-11, Phase B.
Shape	body+base, large closed, flat base.
Degree of preservation	<1/3 preserved.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/4-2.5YR4/6. Interior surface uneven with possible finger impressions.
Fabric	medium-soft, fine texture. Medium number of small + medium black and white inclusions; thin, light core. 10YR6/4. Wear on edge of base. Some grey inclusions
Wall thickness	body 1.0 cm, base 0.6 cm.

Appendix III.2
The petrographic study of the RPP sample

I: MICRITIC LIMESTONE RICH FABRIC WITH FEW FRAGMENTS OF CHERT AND TCFS

Samples: RPP KA-1, RPP KA-2, RPP KA-4, RPP KA-5, RPP KA-6, RPP NAP-8, RPP NAP-10, RPP NAP-12, RPP NAP-13, RPP VK-17, RPP VK-18, RPP VK-19, RPP VK-20, RPP PLK-21, RPP PLK-22, RPP PLK-23, RPP PLK-24, RPP PLK-25, RPP PLK-26, RPP PLK-27, RPP PLK-28, RPP PLK-29, RPP PLK-31, RPP PLK-33, RPP PLK-34, RPP PLK-35, RPP PLK-37, RPP PLK-38, RPP PLK-39, RPP PLK-40, RPP PLK-41, RPP PLK-42, RPP PLK-43, RPP PLK-44, RPP PLK-45, RPP PV-46, RPP PV-47, RPP PV-49, RPP PV-50, RPP KM-51, RPP KM-52, RPP KM-53, RPP KM-54, RPP KM-55, RPP KM-56, RPP KS-57, RPP MA-3570, RPP MA-7229, RPP MA-7428, RPP MA-8789, RPP MA-8962, RPP MA-9369, RPP MA-9496, RPP MA-9999, RPP MA-13067, RPP MA-13143, RPP MA-14228, RPP MA-14361, RPP MA-14370, RPP MA-15316, RPP MA-15337, RPP MA-16438, RPP MA-16444, RPP MA-16486, RPP MA-16511, RPP MA-16733

Microstructure: Rare to absent macro planar voids, vertical to the vessel's margins (RPP MA-7229). Rare macro vughs, and dominant meso and micro vughs. The voids are randomly oriented and are close- to double- spaced. The non-plastic inclusions are also randomly oriented. Presence of secondary calcite, as post-depositional addition.

Groundmass: Homogeneous throughout the sections; the colour varies from very dark brown to yellow in XP (x25) and dark brown to yellowish white in PPL (x25). In some cases there is colour differentiation between the core and the vessels' margins. Other times this colour variation is between the upper margin and the rest of the section and in a few cases there is no colour differentiation and the whole of the thin section is either dark brown or yellow in XP (x25). Samples range from moderately optically active to optically inactive.

Inclusions:
c:f:v $_{0.0625\ mm}$ = 60:10:30 to 40:30:30.
Coarse fraction: 5.4 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with poorly sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from pebbles to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is close- to double spaced, and that of the fine fraction is single- to open-spaced. It is matrix-supported (Wackestone texture).

Coarse fraction
Predominant :
- Micritic limestone; sub-rounded and rounded, high to low sphericity, size 5.4-0.1mm (biggest limestone fragments found in RPP MA-7229 and RPP MA-13143)

Frequent:
- Monocrystalline quartz; angular and sub-angular, medium to low sphericity, size : 1.0-0.1 mm (largest quartz fragments: RPP MA-14370 and RPP MA-16733)

Common:
- Chert: angular and sub-angular; high to low sphericity, size: 1.8-0.1mm.
- Tcfs (clay pellets); rounded and sub-rounded, high to medium sphericity, up to 2.0 mm in long diameter (RPP MA-7428), sometimes containing limestone, quartz, chert, biotite.

- Calcite; sub-rounded, high to low sphericity, size : 2.2-0.1mm, in some cases altered (eg. RPP MA-16486)

Few:

- Polycrystalline quartz; sub-angular, medium to low sphericity, size: 0.6-0.1 mm long diameter

Very few:
- Muscovite; angular and sub-angular, low sphericity, size 0.2-0.1 mm long diameter.
- Serpentine: angular and sub-angular, medium to low sphericity, 0.2-0.1 mm long diameter

Rare:
- Alkali feldspars; angular, low sphericity, size: 0.3-0.1 mm.
- Quartzite: sub-angular and sub-rounded, low sphericity, size: 0.6-0.1 mm
- Skeletal particles or bioclasts

Very rare:
- Microfossils: circular voids which replaced what should be microfossils, small in size, mode: 0.1 mm in diameter.
- Quartzite-schist; angular, low sphericity, size: 0.28 mm long diameter
- Biotite; angular, low sphericity, size: 0.38-0.1 mm long diameter.
- Pyroxene: strong green in colour, angular, low sphericity, 0.1 mm long diameter
- Epidote; sub-angular, low sphericity, 0.1 mm long diameter (RPP MA-16438).

Fine fraction
Dominant**:** micritic limestone
Frequent: monocrystalline quartz
Very few: chert
Rare: Biotite laths, serpentine, muscovite laths,

Amorphous concentration features: Acfs are frequent in this group and vary in shape and colour. They are found both elongated and rounded in shape, dark red to light orange in colour, in XP (x25). Their size varies from 3.0 - <0.1 mm in long diameter. Acfs in the form of clay pellets are many times intermixed with micritic limestone, other times containing quartz and other minerals such as muscovite, calcite and chert. Voids are observed sometimes in the circumference of some qcfs and acfs.

Comments: This is the largest fabric group. It includes all the samples coming from Philia *Laksia tou Kasinou* and *Vasiliko,* Vasilia *Kylistra,* Kissonerga *Mosphilia* and *Skalia,* all the samples except one from Kyra *Alonia*, four out of six samples from Nicosia *Ayia Paraskevi*, and a large proportion of the sample from Marki *Alonia*. All of the corresponding pots are made of a soft fabric (hardness 1 and 2 in Moh's scale). This is a fabric rich in micritic limestone and presents metamorphic characteristics such as chert, quartzite and some rare fragments of quartzite-schist and muscovite mica-schist. Frequent presence of clay striations (e.g. RPP MA-7428, RPP MA-16438, RPP MA-16733). Limestone fragments are rounded and sub-rounded in shape, an indication of natural weathering. Moreover some limestone fragments present indications of oxidation (e.g. RPP MA-8789, RPP MA-13143, RPP MA-15337, RPP MA-16733). Bases present evidence of drawn up clay. Dark areas around the margins of voids indicate the presence of vegetal temper. Most of the microfossils found in this fabric are open and not calcite-filled. Moreover, when found, the microfossils are distributed across the fabric and almost never within a limestone. Only in the case of RPP PLK-28 and MA-7229, calcite filled microfossils are found within limestone fragments.

II: Micritic Limestone Rich Fabric With Microfossils and various igneous Inclusions

Samples: RPP MA-5096, RPP MA-5104, RPP MA-9117, RPP MA-12371, RPP MA-13085, RPP MA-16408, RPP MA-16480, RPP MA-16530

Microstructure: Rare meso to mega planar voids and channels, which most of the times are parallel to the vessels' margins. Common meso and micro vughs which are randomly oriented. The voids are single- to open-spaced. The non-plastic inclusions are randomly oriented.

Groundmass: Homogeneous throughout the section. The colour varies from very dark brown in both PPL and XP (x25) to yellowish white in PPL (x25) and yellow in XP (x25). There is no colour variation between the margins and the core of the vessels. The samples are moderately optically active to inactive.

Inclusions:

c:f:v $_{0.0625\,mm}$ = 50:30:20 to 40:30:30
Coarse fraction: 3.2 mm to 0.1mm long diameter
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is double- to open-spaced and the packing of the fine fraction is close- to double-spaced. It is matrix supported (Wackestone texture).

Coarse fraction

Dominant :

- Micritic limestone; sub-rounded and rounded, high to low sphericity, 1.0-0.1 mm long diameter.

Frequent:

- Calcite; sub-rounded to rounded, high to low sphericity, size : 3.2-0.1mm long
- diameter. Colour varies from pink, to pinkish and yellowish white to brownish
- yellow.
- Basalt; sub-angular and sub-rounded, medium to low sphericity, 0.6-0.1 mm long diameter. In many cases altered basalt and devitrified matrices.
- Monocrystalline quartz ; angular and sub-angular, medium to low sphericity, 0.4-0.1mm.
- Microfossils; mode 0.2 mm in diameter, filled with calcite.
- Alkali feldspars ; angular, low sphericity, mode : 0.2mm long diameter.
- Biotite mica; angular, low sphericity, 0.6-0.1 mm long diameter.

Common:

- Polycrystalline quartz; angular, low sphericity, size: 0.4-0.1 mm long diameter.

Very few:

- Clinopyroxene; angular, low sphericity, 0.2-0.1 mm long diameter
- Plagioclase feldspars: angular, low sphericity, mode: 0.14mm long diameter
- Dolerite; sub-rounded, high sphericity, 1.6-0.6 mm long diameter
- Skeletal particles or bioclasts.

Rare:

- Orthopyroxene; sub-angular, medium to low sphericity, 0.25 mm (RPP MA-16408, RPP MA-12371)

- Metaquartz; sub-angular, medium to low sphericity, 0.2 mm (RPP MA-16480)

Fine fraction
Predominant**:** micritic limestone
Frequent: monocrystalline quartz and microfossils
Few: alkali feldspars, biotite laths, serpentine and pyroxene

Amorphous concentration features: Acfs are very frequent in this fabric. Similarly to the non-plastic inclusions with the exception of micritic limestone, most acfs are small in size, mode: 0.2 mm long diameter. Most of them are actually dark brown opaques. But others vary in colour from bright orange-red to brownish orange and orange. They are shape ranges from angular (!) to rounded and from medium to low sphericity.

Comments: This fabric group includes only samples from Marki. The samples of this fabric group are quite soft ranging from 1 to 2 in Moh's scale. The non-plastic inclusions with the exception of micritic limestone are small in size and mostly angular and have low sphericity. RPP MA-5104 and MA-9117 are the two finest samples of this fabric group. The principal inclusions found in these two samples are calcite and calcite-filled microfossils.

III: IGNEOUS FABRIC WITH SOME MICRITIC LIMESTONE FRAGMENTS AND MICROFOSSILS, AND FREQUENT PRESENCE OF ACFS

Samples: RPP MA-4258, RPP MA-12213, RPP MA-14279, RPP MA-15309

Microstructure: Some mega planar voids, which in some samples are vertical to the section (RPP MA-14279) and in some others parallel to the sections' margins (RPP MA-12213). Frequent meso and micro vughs, which are randomly orientated. Voids are double to open spaced and the non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the section. There is colour variability from reddish brown to olive-brown and dark-brown in XP. There is also colour variation between the margins and core of some samples or between different parts of the sections (XP, x50). The samples are moderately inactive.

Inclusions:
c:f:v $_{0.0625\,mm}$ = 70:20:10 to 50:40:10
Coarse fraction: 4.0 mm to 0.1mm long diameter
Fine fraction: $\leq$ 0.0625 mm long diameter.

The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from pebbles to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is double- to open-spaced and the packing of the fine fraction is close- to double-spaced. It is matrix supported (Wackestone texture).

Coarse fraction
Dominant:
- Calcite; sub-rounded, medium to low sphericity, 0.3mm largest diameter
- Micritic limestone; sub-rounded and rounded, high to low sphericity, 4.0-0.1 mm long diameter.

Frequent:
- Basalt; rounded and sub-rounded, high to low sphericity, 2.0-0.1 mm long diameter.

- Monocrystalline quartz ; angular and sub-angular, medium to low sphericity, 0.4-0.1mm.
- Microfossils; mode 0.2 mm in diameter, filled with calcite.
- Alkali feldspars; angular, low sphericity, mode : 0.2mm long diameter.
- Biotite mica; angular, low sphericity, 0.25-0.1 mm long diameter.

Common:

- Polycrystalline quartz; sub-angular, low sphericity, size: 0.4-0.1 mm long diameter
- Serpentine; sub-angular and sub-rounded, low sphericity, 0.1 mm in long diameter
- Plagioclase feldspars: angular, low sphericity, mode: 0.4mm long diameter

Few:

- Clinopyroxene; sub-angular, medium to low sphericity, 0.3-0.1 mm long diameter

Rare:

- Tcfs; rounded, medium sphericity, 1.00 mm in long diameter (RPP MA-14279)

Fine fraction
Predominant**:** calcite
Frequent: monocrystalline quartz and microfossils
Few: plagioclase feldspars, biotite laths, serpentine and clynopyroxene

Amorphous concentration features: Frequent presence of sub-angular and sub-rounded acfs. Most of them are dark brown opaques, randomly orientated across the sections of the samples. Some of them reach up to 0.5mm in long diameter but most of the acfs are 0.05mm in long diameter.

Comments: This is fabric is very similar to fabric II. However, their main difference is the density of igneous inclusions in fabric III and the presence of microfossils within the micritic limestone fragments of fabric II. Some rock fragments are altered. For example in some basalts the plagioclases are altered to biotite. In this fabric, microfossils are not embedded in the limestone fragments like in fabric II. The inclusions occurring in the limestone fragments include plagioclases, serpentine, biotite and in very rare cases some microfossils.

IV. BIOTITE MICA RICH FABRIC WITH VARIOUS IGNEOUS INCLUSIONS

Samples: RPP NAP-11, RPP MA-5094, RPP MA-7427, RPP MA-10101

Microstructure: Rare meso to mega planar voids and channels, which are randomly orientated. Common meso and micro vughs, which are also randomly orientated. The voids are single to open-spaced and do not follow a particular pattern in their distribution across the section. The non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the section. The colour varies from reddish brown (RPP NAP-11) in XP to dark brown (RPP MA-7427) in XP. There is colour variation between the margins and the core of RPP MA-7427. There is no colour variation in RPP NAP-11, RPP MA-5094. the non-plastic inclusions are randomly orientated.

Inclusions: c:f:v $_{0.0625\ mm}$ = 70:20:10 to 60:15:5
Coarse fraction: 2.5 mm to 0.1mm long diameter

Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is moderately fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is close- to open-spaced and the packing of the fine fraction is double- to open-spaced. It is matrix supported (Wackestone texture).

Coarse fraction
<u>Predominant:</u>
- Biotite; angular and sub-angular, high to low sphericity, 2.5 mm in long diameter.

<u>Frequent:</u>
- Monocrystalline quartz; angular and sub-angular, medium to low sphericity, 0.4 mm in long diameter.

<u>Common:</u>
- Clinopyroxene; angular, medium sphericity, sub-angular, 0.4 mm long diameter
- Dolerite; sub-angular, high to medium sphericity, 2.0 mm long diameter
- Olivine; medium to low sphericity, sub-angular, 0.15 mm long diameter
- Polycrystalline quartz; , sub-angular, medium sphericity 0.3 mm long diameter
- Plagioclase feldspars; angular, low sphericity, 0.4 mm long diameter.

<u>Rare:</u>
- Microfossils; Calcite-filled.

Fine fraction
<u>Frequent:</u> biotite
<u>Common:</u> quartz
<u>Few:</u> plagioclase feldspars

Amorphous concentration features: Some rare sub-angular and sub-rounded, medium to low sphericity, very dark brown, almost black opaques, which are small in size. The largest ones are recorded in RPP MA-7427 and do not exceed 0.4 mm in long diameter.

Comments: Inconsistency in firing. Colour variation patterns differ from sample to sample in this fabric group. This is a fabric very rich in aplastic inclusions.

<u>OUTLIERS:</u> RPP KA-3, RPP NAP-16, RPP MA-7412, RPP MA-9398, RPP MA-15461, RPP MA-16452

Appendix III.3

III.3.a. The RPP ED-XRF dataset

Sample No.	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	Co_3O_4	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	total
1	0.68	3.44	10.12	39.37	0.10	1.17	38.55	0.42	0.02	0.05	0.13	5.77	74	332	98	105	17	46	522	26	93	686	27	18	70.8
2	0.57	6.35	10.81	44.05	0.09	1.17	27.90	0.45	0.02	0.06	0.14	8.17	134	515	92	121	19	48	586	27	81	447	40	12	72.9
3	1.19	3.96	14.50	47.60	0.07	1.40	19.63	0.63	0.04	0.02	0.13	10.64	113	64	162	147	21	21	425	28	68	718	24	3	72.6
4	0.63	3.97	10.82	41.36	0.08	1.19	33.87	0.45	0.02	0.05	0.12	7.23	93	424	93	110	17	47	537	27	76	734	20	14	71.3
5	0.60	4.05	10.89	41.34	0.08	1.26	33.71	0.45	0.02	0.05	0.12	7.20	101	431	85	121	17	46	509	28	80	736	30	19	72.3
10	1.20	5.03	12.60	47.44	0.06	1.63	23.48	0.55	0.03	0.04	0.12	7.67	77	164	85	108	20	54	625	27	83	297	24	13	75.5
11	1.36	6.13	17.55	57.36	0.04	0.63	4.81	0.36	0.03	0.08	0.18	11.32	180	237	183	105	22	11	245	19	37	423	17	4	86.8
12	0.75	3.88	11.58	44.86	0.06	1.09	29.19	0.50	0.02	0.06	0.13	7.71	98	388	141	106	17	52	336	28	100	526	22	15	72.4
13	0.71	3.62	11.77	45.61	0.07	1.14	28.62	0.52	0.02	0.06	0.12	7.56	108	356	143	113	17	54	338	29	112	503	30	14	73.9
17	1.14	3.84	12.33	44.07	0.05	1.48	28.28	0.51	0.02	0.05	0.14	7.91	88	405	96	111	20	73	377	27	100	502	31	16	71.7
19	0.79	2.65	10.18	44.80	0.34	1.12	32.86	0.45	0.02	0.04	0.11	6.43	88	330	92	109	17	54	437	26	84	955	21	43	71.3
20	0.53	3.22	10.87	44.04	0.04	1.05	32.79	0.47	0.02	0.05	0.13	6.55	87	333	80	100	16	64	410	27	101	973	30	68	72.0
21	0.90	3.00	10.91	37.80	0.05	1.10	38.49	0.47	0.02	0.05	0.12	6.92	73	313	146	84	19	59	346	25	96	707	31	17	67.9
22	1.08	3.93	10.09	41.06	0.11	1.19	35.18	0.42	0.01	0.05	0.16	6.54	75	322	135	127	15	52	584	26	75	368	24	18	70.1
23	1.20	3.91	10.29	40.95	0.14	1.23	34.56	0.43	0.01	0.05	0.16	6.89	106	335	97	132	19	54	550	27	83	369	28	14	69.1
24	0.93	4.30	11.74	46.14	0.03	1.27	27.50	0.48	0.02	0.06	0.14	7.21	96	385	81	106	17	63	431	29	90	339	29	18	74.5
25	1.13	4.36	11.75	46.34	0.04	1.23	27.28	0.47	0.02	0.06	0.12	7.03	97	360	72	105	17	60	485	28	93	333	21	17	73.7
26	1.09	4.37	11.70	46.34	0.04	1.22	27.37	0.48	0.02	0.06	0.12	7.03	83	354	77	107	19	62	441	29	90	324	28	17	73.7
27	1.14	4.62	12.30	46.95	0.03	1.32	25.63	0.49	0.02	0.06	0.12	7.16	88	356	90	113	19	66	395	27	95	304	37	17	74.8
28	1.32	3.51	10.85	44.54	0.07	1.11	30.39	0.46	0.02	0.05	0.18	7.32	125	425	139	99	19	49	481	25	75	370	23	13	72.5
31	1.18	3.20	9.83	40.68	0.04	0.97	36.86	0.40	0.01	0.05	0.12	6.49	90	331	80	90	15	46	483	24	77	423	32	17	69.1
33	1.22	4.45	10.88	45.68	0.03	1.16	28.00	0.44	0.02	0.06	0.13	7.73	91	450	140	99	18	52	407	27	92	395	27	12	72.5
34	0.91	4.36	11.35	45.30	0.03	1.19	29.14	0.46	0.02	0.06	0.14	6.87	101	357	77	102	16	60	472	27	85	331	35	17	73.2
35	1.09	3.54	10.02	40.02	0.05	0.83	37.68	0.42	0.01	0.04	0.11	6.03	69	272	91	95	15	43	408	27	80	450	33	20	69.3
37	1.18	3.68	11.73	43.90	0.06	1.29	30.43	0.47	0.01	0.05	0.12	6.91	76	328	125	155	20	63	343	28	90	354	34	15	74.0

Sample No.	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	Co_3O_4	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	total
38	1.06	3.85	10.10	38.91	0.13	1.06	38.09	0.39	0.01	0.04	0.11	6.08	57	320	140	100	16	44	481	25	78	353	35	15	70.1
39	0.86	2.83	10.56	39.69	0.10	1.03	38.78	0.45	0.01	0.03	0.11	5.40	83	153	90	127	17	49	448	30	105	411	29	20	68.8
40	1.16	4.11	11.33	46.49	0.04	1.26	27.29	0.47	0.02	0.05	0.12	7.48	76	392	88	122	19	56	472	28	99	406	33	17	72.7
41	0.85	3.28	10.46	38.13	0.04	1.03	38.32	0.43	0.02	0.05	0.12	7.12	94	297	81	91	19	53	336	34	93	328	26	15	68.6
42	1.06	2.83	10.37	39.74	0.09	1.03	38.81	0.43	0.01	0.03	0.11	5.33	77	157	76	122	17	50	428	30	102	398	32	19	69.6
43	1.26	3.62	10.84	44.05	0.05	1.17	31.64	0.45	0.02	0.06	0.12	6.57	98	327	79	98	18	51	416	28	96	377	24	16	71.0
44	1.50	3.50	11.00	44.15	0.04	1.14	31.24	0.46	0.01	0.06	0.12	6.63	88	342	82	94	20	53	428	28	103	383	33	14	72.0
45	1.22	2.95	10.96	40.66	0.06	1.14	36.12	0.46	0.01	0.05	0.11	6.09	87	272	86	115	18	50	531	30	92	409	27	17	71.3
46	1.51	3.19	11.03	40.92	0.09	0.99	34.70	0.46	0.02	0.05	0.11	6.79	76	270	62	95	18	52	311	31	96	307	28	14	70.3
47	1.36	3.03	11.25	43.05	0.07	0.96	33.39	0.47	0.01	0.04	0.11	6.12	85	228	92	134	19	52	281	31	106	324	29	20	72.1
49	1.33	3.01	11.36	43.16	0.06	0.99	33.08	0.47	0.02	0.04	0.11	6.22	86	223	90	115	18	55	282	32	104	320	32	18	71.9
50	0.84	3.28	11.21	40.57	0.05	1.13	35.27	0.46	0.02	0.05	0.12	6.85	83	274	60	93	17	54	312	31	101	451	33	14	71.2
51	0.67	4.06	10.83	43.63	0.15	1.26	30.96	0.48	0.02	0.06	0.12	7.54	115	393	85	110	18	55	519	26	97	783	31	15	71.4
52	0.69	4.05	11.31	42.96	0.13	1.21	32.12	0.47	0.02	0.05	0.12	6.65	84	342	68	115	18	54	527	25	91	851	30	15	72.0
53	0.53	4.73	13.26	45.89	0.16	1.44	25.61	0.51	0.02	0.06	0.13	7.40	85	363	145	158	21	67	950	24	85	662	23	20	75.0
54	0.81	4.07	13.15	47.09	0.17	1.50	24.84	0.52	0.03	0.05	0.14	7.34	79	320	106	143	20	67	973	24	97	1065	22	19	74.5
55	0.68	4.46	11.35	44.63	0.11	1.12	28.60	0.47	0.02	0.07	0.12	8.14	116	575	77	122	21	55	541	27	84	578	28	13	72.2
56	0.73	3.16	10.89	41.69	0.10	1.02	34.48	0.49	0.03	0.05	0.11	6.96	99	319	73	102	19	49	709	28	89	1469	23	15	71.2
57	0.63	3.62	11.01	41.81	0.15	1.20	34.19	0.46	0.01	0.05	0.11	6.56	95	327	92	134	17	55	533	27	88	483	27	14	72.5
3570	0.84	3.85	10.07	42.97	0.19	1.10	34.07	0.45	0.02	0.06	0.14	5.91	82	325	78	115	16	47	858	26	73	1737	28	13	72.7
4258	0.80	3.96	15.06	49.87	0.24	2.21	16.10	0.55	0.03	0.03	0.28	10.52	175	108	140	257	22	40	775	31	63	1969	BDL	17	84.0
5094	1.33	7.22	16.80	57.69	0.08	0.85	4.86	0.33	0.03	0.08	0.17	10.37	157	205	116	102	18	11	584	17	35	564	16	1	91.3
5096	1.21	2.14	11.07	39.31	0.22	1.64	37.81	0.42	0.01	0.02	0.21	5.37	71	87	76	117	17	34	2075	29	86	3335	BDL	18	74.3
5104	0.56	1.94	9.49	34.80	0.25	1.04	45.83	0.39	0.01	0.02	0.18	4.73	71	94	92	119	16	33	1679	32	77	5351	BDL	16	69.3
7229	0.73	3.69	9.73	39.96	0.11	1.21	37.78	0.39	0.02	0.05	0.10	5.99	95	317	86	110	14	38	450	22	70	1135	45	13	72.0
7412	0.48	2.64	9.34	35.63	0.13	1.19	44.53	0.37	0.04	0.02	0.16	5.19	70	117	131	151	14	41	1462	29	62	640	29	14	68.6
7427	1.07	6.48	15.26	55.94	0.07	0.91	9.11	0.35	0.03	0.07	0.18	10.28	166	176	198	131	18	17	807	15	33	827	16	6	85.4
7428	0.75	3.13	11.80	43.64	0.11	1.45	31.39	0.50	0.03	0.05	0.16	6.64	102	316	109	121	18	55	1120	29	105	1655	30	18	72.6

Sample No.	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	Co_3O_4	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	total
8789	0.72	2.91	10.37	38.66	0.06	1.34	39.27	0.44	0.02	0.04	0.09	5.86	93	213	72	98	18	51	622	24	92	826	23	16	68.3
9117	1.10	3.63	11.72	41.01	0.10	1.27	33.95	0.31	0.01	0.02	0.19	6.44	95	96	191	154	15	30	1285	18	56	419	24	16	76.6
9369	0.75	3.69	9.35	38.95	0.08	1.10	39.70	0.41	0.02	0.05	0.12	5.52	81	275	77	96	16	41	980	22	76	1023	21	13	68.4
9398	1.44	4.46	14.65	54.79	0.15	1.37	12.04	0.66	0.04	0.02	0.17	9.99	146	61	137	145	21	24	803	32	59	811	17	14	88.5
9496	1.01	4.35	10.83	43.48	0.06	1.15	31.82	0.44	0.02	0.07	0.12	6.44	85	305	76	100	17	43	588	26	86	677	21	19	75.7
9999	0.64	3.86	10.66	40.21	0.13	1.56	34.30	0.43	0.02	0.06	0.14	7.79	106	391	60	99	19	52	679	25	76	550	25	14	72.3
10101	1.36	6.27	14.21	52.54	0.15	1.10	14.40	0.32	0.03	0.06	0.17	9.18	139	156	163	157	20	18	957	15	31	466	17	8	83.9
12213	1.32	3.26	12.72	45.90	0.23	1.57	24.74	0.63	0.04	0.02	0.23	9.05	125	79	118	155	20	29	1165	33	77	1102	23	10	76.3
12371	0.91	2.84	13.95	45.37	0.12	1.45	24.57	0.59	0.03	0.02	0.17	9.75	96	86	125	127	22	33	955	33	82	811	17	11	74.4
13067	0.35	4.29	9.90	41.30	0.10	1.35	36.04	0.40	0.02	0.04	0.13	5.88	88	284	91	108	17	45	562	29	81	603	30	15	70.4
13143	0.97	3.08	11.27	41.63	0.12	1.73	34.02	0.48	0.02	0.05	0.11	6.22	89	255	188	108	18	51	717	26	95	1247	23	41	73.0
14279	0.64	3.38	10.33	43.58	0.15	1.63	32.61	0.41	0.02	0.03	0.19	6.70	93	132	170	133	16	27	1377	27	48	1204	19	12	72.1
14361	0.79	3.01	12.33	46.94	0.17	1.78	27.71	0.60	0.02	0.05	0.11	6.19	74	195	72	104	18	55	774	31	127	1431	31	16	74.9
14370	0.84	3.51	12.63	48.11	0.23	2.05	24.89	0.55	0.02	0.04	0.13	6.70	85	176	86	122	20	62	1168	26	109	1092	34	21	75.7
15309	0.74	3.16	12.46	43.57	0.18	1.41	29.28	0.60	0.03	0.02	0.20	8.04	117	85	125	150	19	34	1049	35	79	1295	20	16	73.8
15316	0.86	3.31	10.81	41.72	0.16	1.37	35.94	0.48	0.02	0.04	0.10	4.84	66	198	111	85	15	42	913	23	96	1727	22	25	75.6
15337	1.06	3.55	11.06	41.69	0.08	1.28	34.54	0.43	0.02	0.05	0.09	5.99	79	250	84	87	16	44	484	25	85	538	24	19	75.7
15461	0.64	2.63	11.69	42.16	0.15	1.96	33.34	0.42	0.07	0.03	0.09	6.48	107	158	167	139	17	41	1230	38	57	1246	18	27	77.2
16408	0.55	2.48	8.86	39.43	0.14	1.66	40.84	0.35	0.02	0.02	0.20	5.10	80	86	123	108	13	27	1645	22	40	1272	BDL	15	70.9
16438	0.85	4.76	10.65	42.05	0.08	1.51	33.18	0.42	0.01	0.05	0.11	6.15	98	326	88	101	16	50	420	22	77	578	26	17	76.2
16444	0.70	3.84	12.52	44.43	0.13	1.80	27.06	0.52	0.03	0.06	0.12	8.55	114	382	63	118	20	64	659	29	101	965	31	18	76.6
16452	1.55	4.61	13.45	52.54	0.09	1.70	15.73	0.61	0.03	0.02	0.11	9.37	97	99	83	151	20	30	638	28	57	676	27	9	79.7
16480	1.01	2.57	14.33	46.56	0.10	1.63	23.48	0.56	0.02	0.01	0.16	9.17	131	72	97	114	21	26	930	30	69	2377	18	12	78.9
16486	0.92	4.14	11.13	45.62	0.08	1.63	28.36	0.47	0.02	0.07	0.11	7.19	106	392	128	103	17	47	595	26	85	1014	33	14	75.8
16511	0.53	3.24	10.14	39.32	0.08	1.50	38.36	0.42	0.02	0.05	0.11	6.03	88	296	94	95	15	47	602	24	90	629	31	14	69.4
16530	0.85	2.56	12.33	42.04	0.12	1.99	30.92	0.62	0.03	0.02	0.22	7.88	116	100	112	131	21	37	1347	35	93	2181	BDL	15	71.4
16733	0.52	4.40	9.61	40.08	0.08	1.43	36.68	0.40	0.02	0.06	0.11	6.40	91	415	153	126	15	45	655	27	66	554	21	13	70.2

III.3.b. The chemical variation within the RPP fabric groups as defined by ED-XRF.

Evaluation of the chemical variation within each fabric group calculating the standard deviation (s) and the coefficient of variation (CV. in %) for each oxide after ED-XRF repeated analytical runs of each sample. The arithmetic mean (μ) represents the analysed values of the different samples (n=number of samples). Maximum and minimum analysed values for each fabric group are also given.

	Na_2O	**MgO**	**Al_2O_3**	**SiO_2**	**P_2O_5**	**K_2O**	**CaO**	**TiO_2**	**V_2O_5**	**Cr_2O_3**	**MnO**	**Fe_2O_3**	**Co_3O_4**	**NiO**	**CuO**	**ZnO**	**Ga_2O_3**	**Rb_2O**	**SrO**	**Y_2O_3**	**ZrO_2**	**BaO**	**CeO_2**	**PbO**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**
	Fabric I																							
μ (n=60)	0.91	3.76	11.04	42.84	0.09	1.26	32.51	0.46	0.02	0.05	0.12	6.73	90	325	96	110	18	53	547	27	90	663	28	18
max	1.51	6.35	13.26	48.11	0.34	2.05	39.70	0.60	0.03	0.07	0.18	8.55	134	575	188	158	21	73	1168	34	127	1737	45	68
min	0.35	2.65	9.35	37.80	0.03	0.83	23.48	0.39	0.01	0.03	0.09	4.84	57	153	60	84	14	38	281	22	66	297	20	12
σ	0.27	0.65	0.86	2.68	0.06	0.23	4.36	0.04	0.00	0.01	0.02	0.76	14	82	27	16	2	7	201	2	12	380	5	8
CV	29	17	8	6	60	19	13	9	23	17	13	11	16	25	28	14	9	14	37	9	13	57	18	48
	Fabric II																							
μ (n=7)	0.88	2.59	11.68	41.22	0.15	1.52	33.91	0.46	0.02	0.02	0.19	6.92	94.24	89	117	124	18	31	1417	28	72	2249	8	15
max	1.21	3.63	14.33	46.56	0.25	1.99	45.83	0.62	0.03	0.02	0.22	9.75	131.47	100	191	154	22	37	2075	35	93	5351	24	18
min	0.55	1.94	8.86	34.80	0.10	1.04	23.48	0.31	0.01	0.01	0.16	4.73	70.84	72	76	108	13	26	930	18	40	419	BDL	11
σ	0.25	0.54	2.07	3.97	0.06	0.31	8.27	0.12	0.01	0.00	0.02	2.03	23.01	9	37	15	4	4	414	6	19	1693	11	2
CV	29	21	18	10	39	20	24	27	54	17	11	29	24	10	32	12	20	12	29	21	26	75	128	16
	Fabric III																							
μ (n=4)	0.87	3.44	12.64	45.73	0.20	1.71	25.68	0.55	0.03	0.02	0.22	8.58	128	101	138	174	20	32	1092	32	67	1392	15	13
max	1.32	3.96	15.06	49.87	0.24	2.21	32.61	0.63	0.04	0.03	0.28	10.52	175	132	170	257	22	40	1377	35	79	1969	23	17
min	0.64	3.16	10.33	43.57	0.15	1.41	16.10	0.41	0.02	0.02	0.19	6.70	93	79	118	133	16	27	775	27	48	1102	BDL	10
σ	0.30	0.36	1.93	2.97	0.04	0.35	7.15	0.10	0.01	0.01	0.04	1.61	35	24	23	56	3	6	251	3	14	392	10	3
CV	34	10	15	6	21	20	28	17	21	26	18	19	27	24	17	32	13	18	23	10	22	28	68	26
	Fabric IV																							
μ (n=4)	1.28	6.53	15.96	55.88	0.08	0.87	8.30	0.34	0.03	0.07	0.17	10.29	160	194	165	124	20	15	648	16	34	570	17	5
max	1.36	7.22	17.55	57.69	0.15	1.10	14.40	0.36	0.03	0.08	0.18	11.32	180	237	198	157	22	18	957	19	37	827	17	8
min	1.07	6.13	14.21	52.54	0.04	0.63	4.81	0.32	0.03	0.06	0.17	9.18	139	156	116	102	18	11	245	15	31	423	16	1
σ	0.14173	0.487	1.507	2.355	0.047	0.192	4.543	0.02	0	0.01	0.006	0.878	17	35	36	26	2	4	310	2	3	181	0	3
CV	11	7	9	4	58	22	55	5	8	14	3	9	11	18	22	21	9	25	48	12	8	32	2	68

Appendix III.4
The chemical characterisation of RPP slips using SEM-EDS.

The size of analysed areas varied according to the thickness and degree of preservation of each individual ceramic slip layer. The arithmetic mean represents the analysed values of the different measurements on each sample. Maximum and minimum analysed values and standard deviation (s) values for repetitive runs on the same sample are also given.

Values are given in compound oxides %.

RPP KA-1	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	3.6	19.5	59.0	3.0	2.5	0.9	11.0
s	0	0	1	2	0	0	0	1
min	0.4	3.2	18.8	56.9	2.7	1.9	0.6	10.0
max	0.5	4.1	19.9	61.1	3.4	2.8	1.3	12.6
RPP KA-2	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.3	5.2	19.5	59.3	3.4	1.9	0.9	9.5
s	0	0	1	2	1	2	0	1
min	0.2	5.0	18.1	56.6	2.8	1.0	0.6	8.7
max	0.4	5.8	20.6	61.7	4.3	4.3	1.3	9.8
RPP KA-5	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	BDL	5.7	13.3	63.8	2.4	3.6	0.5	8.6
s	BDL	1	1	3	0	1	1	1
min	BDL	4.6	12.0	60.9	2.1	3.0	0.0	6.8
max	BDL	7.7	13.9	68.0	2.7	4.1	1.1	9.5
RPP NAP-8	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	3.7	18.8	62.9	3.5	1.4	0.8	8.3
s	0	0	1	0	0	0	0	1
min	0.4	3.6	17.7	62.5	3.2	1.0	0.8	7.7
max	0.7	4.0	19.7	63.3	3.7	1.6	0.9	8.8
RPP NAP-16	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	3.1	22.2	57.8	1.8	3.3	1.1	9.9
s	0	0	2	2	1	1	0	1
min	0.3	3.0	20.2	55.4	1.3	2.7	0.9	9.4
max	1.2	3.2	23.7	60.9	2.6	4.1	1.2	11.0
RPP VK-17	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.4	2.4	21.1	57.0	2.3	4.5	0.7	11.2
s	0	0	1	4	0	5	1	1
min	0.3	1.9	19.7	50.6	2.0	1.6	0.0	10.4
max	0.5	2.9	22.2	59.9	2.5	12.2	1.1	12.6
RPP VK-19	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.2	2.4	18.8	60.8	3.5	2.9	1.0	10.5
s	0	0	1	1	0	0	0	0
min	BDL	2.1	18.0	59.1	3.4	2.8	0.9	10.2
max	0.5	3.0	19.8	61.9	3.6	3.0	1.2	11.1
RPP VK-20	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.3	2.3	17.0	67.0	2.0	2.1	0.8	8.1
s	0	0	1	2	1	0	0	1
min	0.2	2.0	15.3	65.3	1.5	1.9	0.6	7.1
max	0.4	2.4	18.2	70.4	2.9	2.2	1.1	8.7

RPP PLK-22	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.8	2.8	21.4	60.2	2.4	2.2	1.1	8.6
s	0	0	1	1	0	0	0	1
min	0.7	2.7	20.5	58.4	2.2	2.1	0.9	8.0
max	0.8	3.0	22.4	61.5	2.6	2.3	1.3	9.2
RPP PLK-31	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.7	2.6	19.9	59.7	3.2	2.1	1.0	10.6
s	0	0	1	1	0	0	0	1
min	0.6	2.5	19.3	58.9	3.0	1.7	0.9	9.9
max	0.8	2.9	20.5	60.1	3.7	2.5	1.1	11.2
RPP PLK-39	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.8	2.8	20.6	58.3	2.7	2.1	1.4	11.0
s	0	0	0	2	0	0	1	1
min	0.7	2.6	20.3	56.3	2.4	1.9	0.9	10.3
max	0.9	2.9	21.3	59.9	3.0	2.3	2.4	12.1
RPP PLK-44	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.8	2.5	19.4	59.9	2.2	2.4	1.0	11.4
s	0	0	0	2	0	1	0	2
min	0.6	2.3	18.9	57.6	2.0	1.8	0.9	10.2
max	1.0	2.6	19.8	62.5	2.6	4.0	1.0	13.8
RPP PV-46	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1.3	3.1	21.6	61.8	2.3	1.6	0.9	7.3
s	0	1	2	1	0	0	0	1
min	0.8	2.5	19.6	61.0	2.0	1.5	0.6	6.2
max	1.6	4.4	23.5	63.0	2.8	1.8	1.6	8.6
RPP PV-47	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1.7	1.9	20.5	62.7	1.7	1.9	0.8	8.7
s	0	0	0	1	0	0	0	1
min	1.4	1.9	20.0	62.0	1.6	1.8	0.6	7.9
max	2.2	2.0	20.8	63.7	1.8	1.9	1.1	9.6
RPP PV-49	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1.0	2.0	20.4	61.4	3.3	1.5	0.8	9.6
s	0	0	1	1	2	0	0	1
min	0.7	1.6	19.5	59.9	1.7	1.0	0.8	7.5
max	1.3	2.3	21.8	63.0	6.4	1.8	0.9	10.9
RPP KM-51	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.3	2.8	21.7	57.5	2.9	2.2	1.1	11.6
min	0.2	2.6	19.8	56.7	2.6	1.4	0.9	11.0
max	0.4	2.9	22.6	58.1	3.4	3.0	1.3	12.6
RPP KM-54	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	2.1	22.0	58.5	3.7	1.9	1.7	9.4
s	0	0	1	1	0	1	0	1
min	0.4	1.9	21.6	57.5	2.8	1.5	0.8	9.2
max	1.0	2.4	22.5	59.1	4.5	2.4	3.0	9.8
s	0	0	0	1	1	0	1	0
RPP KM-55	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.4	2.8	23.1	59.3	2.1	2.1	0.8	9.4
s	0.1	0.1	0.8	0.7	0.1	0.2	0.1	0.6
min	0.4	2.6	22.2	58.7	2.0	2.0	0.8	8.7
max	0.5	2.9	24.1	60.1	2.3	2.3	0.9	10.1
RPP KM-56	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.3	3.0	19.9	57.0	4.1	3.0	1.2	11.5

s	0	1	1	1	0	1	0	0
min	BDL	2.4	19.1	55.9	3.5	2.4	1.2	11.0
max	0.5	3.6	21.1	58.8	4.5	3.6	1.3	12.0
RPP MA-3570	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1.0	2.4	22.4	62.1	3.8	2.8	0.6	4.8
s	0	1	1	2	1	0	0	1
max	1.2	2.8	23.7	63.7	5.1	3.0	0.6	5.6
min	0.7	1.8	20.9	60.1	3.0	2.5	0.5	4.4
RPP MA-7427	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1	3.6	23.9	59.1	2.9	3.2	0.5	5.8
s	0	2	4	1	1	4	0	1
max	1.3	5.9	26.8	60.7	4.8	9.4	1	6.7
min	0.7	2.1	17.8	58	1.7	0.9	0	4.5
RPP MA-7428	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.3	2.6	18.2	65.7	2.2	3.0	0.8	7.2
s	0	1	1	2	0	0	0	1
max	0.54	3.21	19.7	67.57	2.38	3.17	0.96	8.24
min	BDL	2.2	17.22	64.21	2.06	2.67	0.75	6.4
RPP MA-8789	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	2.5	22.0	59.5	2.4	4.1	0.7	8.0
s	0	0	1	2	0	1	0	1
max	0.7	2.9	22.5	61.5	2.6	5.7	0.8	8.7
min	0.5	2.0	21.5	57.8	2.1	2.8	0.7	7.3
RPP MA-8962	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	1.7	18.8	56	4.1	7.5	1.1	10.3
s	0	0	2	5	1	5	0	1
max	1.2	2.1	21	65.8	5.5	17.1	1.6	12.2
min	BDL	1.3	14.8	51.8	3.2	3.6	0.7	8.3
RPP MA-9496	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.4	2.3	21.6	58.9	3.2	3.3	0.9	9.4
s	0	0	1	2	0	0	0	0
max	0.4	2.4	22.6	60.1	3.4	3.8	1.0	9.8
min	0.4	2.1	20.7	57.0	3.0	3.0	0.8	9.1
RPP MA-9999	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	1.0	2.4	20.4	62.6	3.6	2.9	0.7	6.4
s	0	0	3	4	1	0	0	1
max	1.1	2.8	23.4	67.5	4.1	3.2	0.9	7.1
min	0.8	2.0	17.3	58.8	3.0	2.5	0.5	5.1
RPP MA-13085	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	1.9	20.5	64.8	3.0	1.5	0.8	7.0
s	0	0	5	5	0	0	0	1
max	0.7	2.4	25.6	70.3	3.2	1.7	1.2	8.4
min	0.4	1.6	16.7	60.5	2.8	1.3	0.5	5.9
RPP MA-15309	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	3.1	22.0	62.2	2.7	2.4	0.8	6.2
s	0	0	1	1	0	0	0	1
max	0.61	3.38	23.17	63.19	2.88	2.53	0.89	6.81
min	0.53	2.87	21.42	60.76	2.51	2.34	0.61	5.6
RPP MA-15316	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	BDL	1.6	16.9	60.4	3.9	2.0	1.2	14.0
s	BDL	0	2	2	0	0	0	1
max	BDL	1.9	19.7	62.3	4.5	2.2	1.3	14.7

min	BDL	1.4	14.6	58.3	3.5	1.8	1.0	13.5
RPP MA-15337	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	2.6	20.9	59.7	3.0	2.3	1.2	9.6
s	0	0	1	2	1	0	0	1
max	0.6	2.9	21.4	61.5	3.6	2.5	1.4	10.0
min	0.5	2.4	20.4	58.0	2.5	2.2	1.0	9.2
RPP MA-15461	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	2.5	20.9	54.5	3.4	3.3	0.8	13.8
s	0	0	1	1	0	0	0	1
max	0.8	2.9	21.6	55.4	3.7	3.6	1.0	14.6
min	0.5	2.0	20.2	53.7	3.1	2.9	0.7	13.2
RPP MA-16408	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.4	1.7	20.2	55.1	6.0	2.6	1.0	13.1
s	0	0	1	2	3	0	0	1
max	0.6	2.1	21.3	57.2	9.7	3.3	1.0	13.9
min	0.4	1.5	18.5	52.5	3.7	2.3	0.9	12.5
RPP MA-16486	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	2.5	20.8	59.1	3.1	3.1	0.9	10.0
s	0	0	0	2	1	1	0	2
max	0.52	2.81	21.01	60.74	3.48	3.55	1.04	11.6
min	0.48	2.15	20.66	57.55	2.62	2.61	0.73	8.46
RPP MA-16511	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.6	2.8	23	60.3	3.2	3.2	1.1	5.7
s	0	0	1	2	1	1	0	1
max	0.7	3	24.2	62.3	3.7	4.7	1.5	6.1
min	0.6	2.6	21.9	58.6	2.8	2.7	0.7	5.1
RPP MA-16733	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	0.5	2.6	20.5	57.6	3.3	3.6	1	10.8
s	0	0	1	2	0	1	0	1
max	0.6	2.8	21.6	60.3	3.7	5.3	1.2	11.5
min	0.4	2.4	19.1	55.5	3	2	0.8	10.2

Appendix IV.1
The Marki sample – A synopsis

	RPP		PRS		WPP		**RP**		**RPCP / RPC**		**ERS**		**other ceramic types**		**Totals**
	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	
	RPP-9369	SO	PRS-10234	SO	WPP-7761	LO	RP-10242	SO	RPCP-13016	CP			CW-10224	mealing bin	
	RPP-9496	SO	PRS-16532	LO	WPP-14604	?			RPCP-13105	CP					
Phase A	RPP-9999	LC	PRS-16533	?					RPCP-13140	CP					**16**
	RPP-13143	LC							RPCP-13147	CP					
	RPP-16530	SO													
	RPP-7412	SO	PRS-14338	LC	WPP-14401	SO	RP-14377	SO	RPCP-7437	CP					
	RPP-7427	LC	PRS-15277	LO	WPP-15242	SO	RP-14379	SC	RPCP-15301	CP					
	RPP-7428	LC							RPCP-15303	CP					
	RPP-9398	LC							RPCP-15305	CP					
	RPP-10101	SO													
Phase B	RPP-14361	LC													**21**
	RPP-14370	LC													
	RPP-15309	SO													
	RPP-15316	LC													
	RPP-15337	SO													
	RPP-16733	LC													
	RPP-8962	LC	PRS-14280	LC	WPP-9112	SO	RP-14225	LC	RPCP-15163	CP					
	RPP-9117	LC	PRS-14323	LC	WPP-13529	LO	RP-14354	LC	RPCP-15638	LC					
	RPP-12371	LC	PRS-16466	LO	WPP-16234	?	RP-15646	S0	RPC-15640	CP					
	RPP-13067	LC	PRS-16477	LC	WPP-16513	LO	RP-15649	SO							
Phase C	RPP-14279	LO	PRS-16549	?			RP-16499	SO							**31**
	RPP-16408	SO					RP-16541	SO							
	RPP-16438	LC					RP-16543	SO							
	RPP-16444	LC													
	RPP-16452	LC													
	RPP-16480	LO													

	RPP		PRS		WPP		**RP**		**RPCP / RPC**		**ERS**		**other ceramic types**		**Totals**
	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	
	RPP-16486	LC													
	RPP-16511	SO													
Phase D	RPP-8789	LO	PRS-9121	LC	WPP-8551	LC	RP-12473	SO	RPCP-10210	CP					**18**
	RPP-12213	LO	PRS-9173	LC			RP-14262	pan	RPCP-10212	CP					
			PRS-12215	SO			RP-14961	SO	RPC-16175	CP					
							RP-15450	LC	RPC-16194	CP					
							RP-15770	SO	RPC-16395	CP					
							RP-16199	LC							
							RP-16562	LO							
Phase E	RPP-14228	LC					RP-3265	LC	RPC-15382	CP			HOB-3242	hob	**10**
							RP-5862	SO	RPC-14347	CP					
							RP-12800	SO	RPC-15183	CP					
							RP-14097	LC							
							RP-14963	LO							
Phase F	RPP-3570	SC			WPP-7709	LC	RP-3609	SC	RPC-7193	CP	ERS-5812	LC	CW-3726	mealing bin	**36**
	RPP-5094	SO					RP-4351	SC	RPC-12940	CP	ERS-16534	LC	LOOM-13585	loomweight	
	RPP-5104	LC					RP-5826	LC	RPC-12942	CP			LOOM-13829	loomweight	
	RPP-15461	SO					RP-7199	SO							
							RP-7208	SO							
							RP-7216	SO							
							RP-7256	SO							
							RP-7300	SO							
							RP-7301	SO							
							RP-7307	LC							
							RP-7308	LO							
							RP-7314	LC							
							RP-7316	SC							
							RP-7320	LC							
							RP-7359	SO							

	RPP		PRS		WPP		**RP**		**RPCP / RPC**		**ERS**		**other ceramic types**		**Totals**
	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	
							RP-7464	pan							
							RP-12359	SO							
							RP-12361	LC							
							RP-12372	SO							
							RP-12841	SO							
							RP-12944	SC							
							RP-13025	SO							
							RP-14053	SO							
Phase G	RPP-7229	SO					RP-9200	LC	RPC-9062	CP			CW-9186	mealing bin	**16**
							RP-9242	LO	RPC-9176	CP			CW-9207	mealing bin	
							RP-9248	LC	RPC-9243	CP			HOB-13262	hob	
							RP-12811	SO							
							RP-12954	LO							
							RP-13007	LO							
							RP-14204	SO							
							RP-14313	LC							
							RP-16203	LC							
Phase H	RPP-4258	SO	PRS-9642	LC			RP-1082	LC	RPC-1089	CP	ERS-6416	LO			**17**
			PRS-9724	SO			RP-1099	SO	RPC-6128	LC	ERS-15739	LO			
							RP-3305	SC	RPC-6453	CP					
							RP-4864	LC	RPC-16677	CP					
							RP-5770	SO							
							RP-6365	LC							
							RP-7278	SO							
							RP-12933	SO							
Phase I							RP-11341	SO	RPC-7493	CP	ERS-11353	LC			**15**
							RP-11477	LO	RPC-11478	CP	ERS-11482	LO			
							RP-12193	SO	RPC-12823	CP	ERS-12353	LO			
							RP-12239	LO			ERS-12456	SO			

	RPP		PRS		WPP		**RP**		**RPCP / RPC**		**ERS**		**other ceramic types**		**Totals**
	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	sample no.	shape	
							RP-12458	SC							
							RP-14957	SO							
							RP-14958	LC							
							RP-15481	LC							
Unknown	RPP-5096	SO	PRS-7471	LO			RP-7173	pan							**5**
	RPP-13085	SO					RP-11359	LC							
Totals	**39**		**16**		**10**		**72**		**32**		**8**		**8**		**185**

Small Closed (SC)
Small Open (SO)
Large Closed (LC)
Large Open (LO)
Cooking Pot (CP)

Appendix IV.2
IV.2.a. The macroscopic study of the Marki sample[45]

Sample no.	RP-1082 (fabric IX)[46] 
Ware	RP
Context	Context 139, XXV-1, Phase H
Shape	Large closed, jug horizontal, round mouth. Everted, constant, rounded rim. RimD: general 100-200, specific 120.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR4/6-10R4/6. Slip extends 35mm inside vessel below rim.
Fabric	Medium-soft, fine texture; few small black and white inclusions; thick, light core.
Wall thickness	rim 0.6 cm, below rim 0.7 cm.

Sample no.	RP-1099 (Outlier) 
Ware	RP
Context	Context 136, XXV-1, Phase H
Shape	Spouted bowl, rim + spout, small open, incurved, thinning, rounded rim, open spout
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 10R4/6 Interior: medium slip, medium lustre, no mottling, 10R4/6
Fabric	Medium-soft, fine texture. No inclusions, no core. 7.5YR5/6
Wall thickness	Rim 0.2 cm, below rim 0.4 cm.

[45]This information was given by D. Frankel and J.M. Webb (2006a).

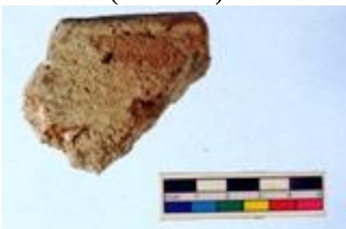
[46] As defined by petrographic analysis.

Sample no.	HOB-3242 (fabric VI) 
Artefact type	Hob
Context	Context 401, XX-4, Phase E
Surface treatment – Interior/Exterior	Exterior: no slip Fragment from rounded upper surface of arm. Other edges broken. Decorated with two parallel diagonal incised lines (L 28). Smooth unslipped surface.
Fabric	very soft, medium texture. Medium number of medium + large black and white inclusions, no core. 10YR5/4 Some gravel-sized black and white inclusions and chopped straw and other organics.

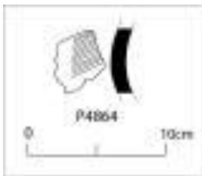
Sample no.	RP-3265(fabric XII) 
Ware	RP
Context	Context 388, XXX-2, Phase E.
Shape	body, large closed
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6. Decoration: incised. Very regular, fine incision with regular margins. Rounded in section. White in-fill well preserved. In some areas slip visible inside grooves, where infill has fallen out. Seven-line horizontal discontinuous zigzag above multiple parallel horizontal lines.
Fabric	Soft, very fine texture; few small black and white inclusions; thick, dark core. 7.5YR5/6
Wall thickness	Body 0.6 cm.

Sample no.	RP-3305 (fabric XII) 
Ware	RP
Context	Context 356, XXX-1, Phase H
Shape	body, small closed
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR5/6. Decoration: incised. Complex decoration. Multiple concentric chevrons, vertical framed hatched band, sets of multiple parallel horizontal lines. Rounded incisions, narrow with regular even margins. Slip inside incisions and possibly some white in-fill. Points of insertion of tool evident as rounded and deeper areas at beginning of lines.
Fabric	Soft, very fine texture; few small white inclusions, no core. 10YR6/4
Wall thickness	Body 0.6 cm.

Sample no.	RP-3609 (fabric XII) 
Ware	RP (Early RP)
Context	Context 360, XX-2, Phase F
Shape	body, small closed
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 10YR6/6-2.5YR4/8. Decoration: incised. Orientation uncertain. A single long straight line with two parallel angled lines off one side and three parallel angled lines off the other side at one end of sherd (as preserved). Two parallel incised lines to one side of sherd (as preserved). Incision regular, deep and broad with even margins and rounded section.
Fabric	Fabric: medium-soft, very fine texture; few small + medium black and white inclusions; thick, light core. 10YR6/4
Wall thickness	Body 0.7 cm.

Sample no.	CW-3726 (fabric IV) 
Ware	CW
Context	Context 343, XX-2, Phase F
Shape	Mealing bin, rim, large open, straight, constant, flattened rim.
Surface treatment – Interior/Exterior	Exterior: no slip. Interior: thin slip, slight lustre, no mottling, 10R4/6. Slip worn on interior and on top of rim on exterior. Wall formed against a vertical surface.
Fabric	Soft, medium texture. Medium number of small + medium black, red and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 1.6 cm, below rim 1.6 cm, body 1.6 cm.

Sample no.	RP-4351 (fabric XII) 
Ware	RP
Context	Context 436, XXI-2, Phase F
Shape	body, small closed
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 5YR5/8-5YR3/4 Decoration: incised. Broad deep incision, with some slip inside. Four parallel lines. One angled line, part of unidentifiable motif.
Fabric	Soft, very fine texture; few small white inclusions, no core. 10YR4/3
Wall thickness	Body 0.7 cm.

Sample no.	RP-4864 (fabric VII)  
Ware	RP (Early RP)
Context	Context 466, XV-4, Phase H.
Shape	body, large closed. From a medium-sized closed vessel.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 7.5YR5/4-7.5YR5/6. Decoration: incised. Twelve or more parallel angled incised lines, without border. Distinctive fabric colour with red and white inclusions. Very fine and relatively soft. Incision regular with smooth even margins and very carefully executed with all lines starting at same point and running neatly parallel to each other. Incisions rounded in section, even in depth. Some white in-fill. No slip in incisions.
Fabric	soft, very fine texture. Medium number of small + medium red and white inclusions, no core. 10YR6/4. Interior is greyish and well smoothed. Fired soft to medium-soft.
Wall thickness	body 1.1 cm.

Sample no.	RP-5770 (fabric X) 
Ware	RP
Context	Context 692, LXII-2, Phase H.
Shape	Bowl, rim, small open, incurved, thinning, rounded rim RimD: general 100-200, specific 160.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR5/8-2.5YR4/6. Interior: medium slip, slight lustre, no mottling, 5YR5/8-5YR4/6.
Fabric	Medium-soft, fine texture; few small + medium black and white inclusions; thin, light core. 7.5YR6/6
Wall thickness	Rim 1.0 cm, below rim .03 cm, body 0.5 cm.

Sample no.	ERS-5812 (fabric XIII) 
Ware	ERS
Context	Context 603, XVI-3, Phase F.
Shape	Jug neck, large closed, <1/3 preserved. upward tapering neck RimD: general <100. Neck-baseD 54
Surface treatment – Interior/Exterior	Exterior: thin slip, slight lustre, no mottling, even burnishing, 5YR5/4.
Fabric	Medium-hard, very fine texture; few small + medium black, red and white inclusions, no core. 7.5YR7/4
Wall thickness	Wall thickness at neck base 0.8 cm, thinning upward to 0.5 cm.

Sample no.	RP-5826 (fabric VIII) 
Ware	RP
Context	Context 603, XVI-3, Phase F
Shape	Rim and neck, large closed, horizontal, round mouth. Everted, thickening, flattened rim.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6.
Fabric	Medium-hard, medium texture. Medium number of small + medium white inclusions, no core. 5YR4/6
Wall thickness	rim 0.7 cm, below rim 0.8 cm.

Sample no.	RP-5862 (fabric II) 
Ware	RP
Context	Context 663, XVI-5, Phase E
Shape	Bowl, rim, small open, incurved, constant, rounded rim. RimD: general 100-200, specific 180.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR5/6-10YR3/1. Interior: medium slip, slight lustre, no mottling, 5YR5/6.
Fabric	Medium-hard, medium texture; few small black and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.6 cm.

Sample no.	RPC-6128 (fabric VIII) 
Ware	RPC
Context	Context 690, LI-1, Phase H
Shape	Rim and neck, large closed, horizontal, round mouth. Flaring, constant, flattened rim. Concave neck. RimD: general 200-300.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight mottling, 5YR4/6-5YR3/2. Slipped over whole sherd on interior
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR4/4
Wall thickness	Rim 0.4 cm, below rim 0.5 cm.

Sample no.	RP-6365 (fabric X) 
Ware	RP
Context	Context 718, LII-2, Phase H
Shape	Round base - large closed-Vessel thickens markedly to base.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR6/8-5YR4/1.
Fabric	Medium-soft, fine texture; few small black and white inclusions; thin, light core. 5YR5/6
Wall thickness	Body 1.0 cm, base 2.2 cm.

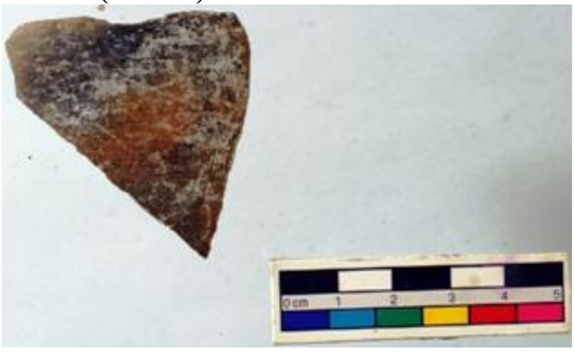
Sample no.	ERS-6416 (fabric VII) 
Ware	ERS
Context	Context 744, LII-2, Phase H
Shape	Bowl-rim, large open, incurved, constant, rounded rim. RimD: general 200-300.
Surface treatment – Interior/Exterior	Exterior: worn slip, no mottling, 5YR6/6. Interior: worn slip, no mottling, 5YR6/6.
Fabric	Medium-soft, very fine texture; few small black, red and white inclusions, no core. 10YR7/4
Wall thickness	Rim 0.3 cm, below rim 0.7 cm, body 0.8 cm.

Sample no.	RPC-6453 (fabric VIII) 
Ware	RPC
Context	Context 790, LII-2, Phase H-1.
Shape	Cooking pot. Rim, large closed, horizontal, round mouth. Flaring, constant, flattened rim. Rim profile irregular. Thinning on one side and constant to thickening on the other. RimD: general 100-200, specific 140.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 2.5YR3/2-2.5YR3/0.
Fabric	Medium-hard, medium texture; few small black and white inclusions; thick, dark core. 5YR3/3
Wall thickness	Rim 0.3 cm, below rim 0.5 cm, body 0. 6 cm.

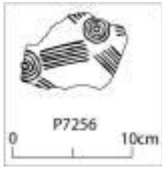
Sample no.	RP-7173 (fabric II)  
Ware	RP
Context	Context 0.
Shape	Pan, handle + base, large open, straight, thinning, rounded rim. Base very thin. No punctures. Very low wall. Thick semicircular (D-shaped) handle rising in same plane as wall/rim, without perforation. Top area missing. Wall thickens considerably at this point and base flange flares out in semicircle. W of handle at base (where rises from wall) 60mm. MaxTh of handle 22. PresHt with handle 40.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 10YR4/1. Interior: thin slip, matt lustre, no mottling, 10YR4/1.
Fabric	Soft, fine texture. Medium number of small + medium black and white inclusions, no core. 10YR4/3
Wall thickness	Body and base 0. 5 cm.

Sample no.	RPC-7193 (fabric VIII) 
Ware	RPC
Context	Cooking pot? base, small closed, foot base. Ht of foot 44
Shape	Context 938, L-4, Phase F
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 5YR3/2.
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 5YR4/6

Sample no.	RP-7199 (Outlier) 
Ware	RP
Context	Context 938, L-4, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR4/6-2.5YR2.5/0. Interior: medium slip, slight lustre, no mottling, 7.5YR4/3-7.5YR4/4.
Fabric	medium-hard, fine texture; few small + medium black and white inclusions; thin, light core. 7.5YR5/6
Wall thickness	rim 0.2 cm, below rim 0.3 cm, body 0.5 cm.

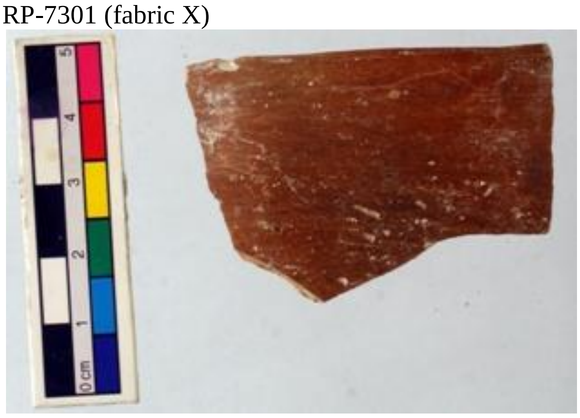
Sample no.	RP-7208 (fabric X) 
Ware	RP
Context	Context 938, L-4, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 7.5YR4/4-7.5YR3/0. Interior: medium slip, medium lustre, no mottling, 2.5YR4/8.
Fabric	Medium-hard, fine texture; few small + medium black and white inclusions; thick, dark core. 7.5YR5/6
Wall thickness	rim 0.1, below rim 0.2 cm, body 0.6 cm.

Sample no.	RP-7216 (fabric IV) 
Ware	RP
Context	Context 938, L-4, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 140.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 7.5YR4/0-7.5YR4/2. Interior: medium slip, matt lustre, no mottling, 7.5YR4/0-7.5YR4/2. Both surfaces dark brown and grey. Interior shows some blistering of slip. Irregular thickness through section.
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thick, light core. 5YR5/6 Organics present.
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.9 cm.

Sample no.	RP-7256 (fabric XII)  
Ware	RP
Context	Context 951, L-4, Phase F
Shape	Gourd juglet, body, small closed
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR5/8. Decoration: incised. Deep fine incision
Fabric	Soft, very fine texture; few small black, red and white inclusions, no core. 7.5YR5/4-5/6
Wall thickness	Body 0. 6 cm.

Sample no.	RP-7278 (fabric X) 
Ware	RP
Context	Context 903, LI-3, Phase H
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, slight mottling, even burnishing, 2.5YR5/6-2.5YR4/0. Interior: medium slip, matt lustre, no mottling, 2.5YR5/6.
Fabric	Medium-hard, fine texture. Medium number of small + medium black and white inclusions, no core. 5YR5/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

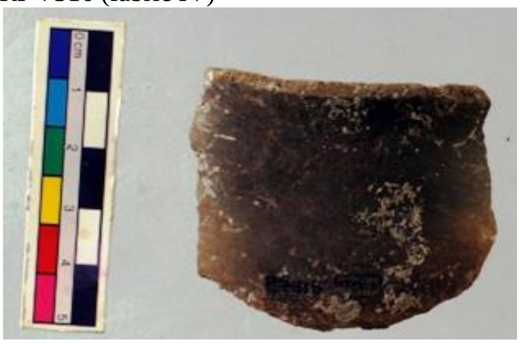
Sample no.	RP-7300 (fabric VIII) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Bowl, rim, small open- incurved, thinning, rounded rim. RimD: general 100-200, specific 140.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, medium mottling, even burnishing, 5YR5/6-5YR3/1. Interior: medium slip, slight lustre, no mottling, 2.5YR4/6.
Fabric	Medium-soft, fine texture; few small black and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.5 cm.

Sample no.	RP-7301 (fabric X) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 160.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6-2.5YR4/4. Interior: medium slip, medium lustre, no mottling, 5YR4/6.
Fabric	Medium-soft, fine texture; few small black and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

Sample no.	RP-7307 (fabric VI) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Large closed, flat base.
Surface treatment – Interior/Exterior	Exterior: worn slip, no mottling, 2.5YR4/6.
Fabric	Medium-hard, fine texture. Medium number of small + medium + large black, red and white inclusions. thick, dark core. 10YR6/3. Many organics present.
Wall thickness	base 1.9 cm.

Sample no.	RP-7308 (fabric IV) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Large open, flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR4/3. Interior: medium slip, matt lustre, no mottling, 5YR4/3.
Fabric	Hard, medium texture; few small + medium black and white inclusions; thick, dark core. 5YR4/6
Wall thickness	Base 1.4 cm.

Sample no.	RP-7314 (fabric IV) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Pithos -large closed, horizontal, round mouth. Flaring, thinning flattened rim
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6
Fabric	Medium-hard, medium texture; few small + medium black and white inclusions; thick, light core. 5YR5/6

Sample no.	RP-7316 (fabric IV) 
Ware	RP
Context	Context 907, L-4, Phase F
Shape	Jar, small closed, horizontal, round mouth. Flaring, thinning, rounded rim. widening neck. Probable lid wear
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 7.5YR4/2-7.5YR3/2. Slipped on interior. Straight line of abrasion on top and immediately below rim on exterior (approx 1 wide)
Fabric	Hard, medium texture; few small + medium black and white inclusions, no core. 7.5YR4/4
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.6 cm.

Sample no.	RP-7320 (fabric II) 
Ware	RP
Context	Context 907, L-4, Phase F.
Shape	Jar large closed, horizontal, round mouth. Flaring, thinning, rounded rim. Possibly RPC cooking pot.
Surface treatment – Interior/Exterior	Exterior: thin slip, no mottling, 5YR4/4.
Fabric	Hard, medium texture; few small + medium + large black, red and white inclusions. thick, dark core. 5YR4/3
Wall thickness	Rim 0.5 cm, below rim 0.7 cm, body 0.8 cm.

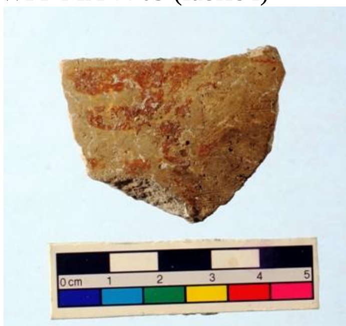
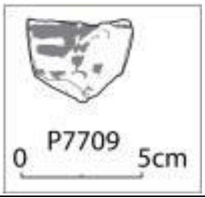
Sample no.	RP-7359 (fabric IX) 
Ware	RP
Context	Context 835, LXVI-8, Phase F
Shape	Bowl, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR4/6. Interior: medium slip, medium lustre, no mottling, 2.5YR4/6. Interior slip largely worn off.
Fabric	Medium-soft, fine texture; few small black and white inclusions; thin, dark core. 7.5YR6/6
Wall thickness	Rim 0.1 cm, below rim 0.3 cm, body 0.7 cm.

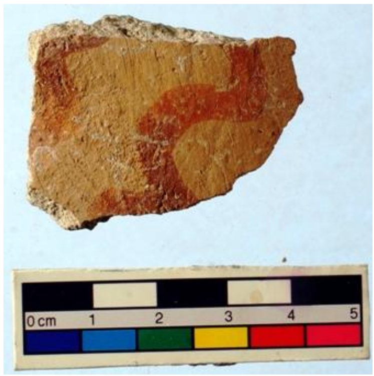
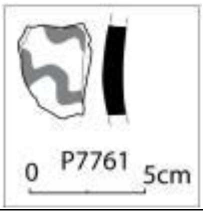
Sample no.	RPCP-7437 (fabric V) 
Ware	RPC
Context	Context 982, L-11, Phase B
Shape	Cooking pot. Large closed, horizontal, round mouth. Everted, thinning, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: no slip. No apparent slip. Surfaces dull grey 10YR5/2-5/3.
Fabric	Medium-hard, medium texture; few small + medium black and white inclusions; thick, dark core. 10YR5/4
Wall thickness	rim 0.3 cm, below rim 0.4 cm, body 0.9 cm.

Sample no.	RP-7464 (fabric II) 
Ware	RP
Context	Context 987, LI-7, Phase F
Shape	Pan, large open, straight, thinning, rounded rim, flange base. RimD: general 300-400
Surface treatment – Interior/Exterior	Exterior: thick slip, slight lustre, no mottling, even burnishing, 5YR4/3. Interior: medium slip, slight lustre, no mottling, 7.5YR5/4. Slipped on interior and on exterior walls. No slip on base. No discolouration. Light mat impression on base
Fabric	Medium-soft, medium texture. Medium number of small + medium black and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 0.3 cm, below rim 0.6 cm, base 1.0 cm.

Sample no.	PRS MA-7471 (fabric IV) 
Ware	PRS
Context	Context 919, D24 - ploughsoil.
Shape	base+body, large open, flat base. Thin, tapering base.
Surface treatment – Interior/Exterior	body 7, base 5.
Fabric	*Exterior*: worn slip, slight lustre, no mottling, irregular burnishing, 5YR5/6. *Interior*: thick slip, slight lustre, no mottling, 10YR5/3. Exterior slip very worn but appear to be remains of oblique horizontal stroke burnishing above base
Wall thickness	medium-soft, medium texture. Medium number of small + medium black and white inclusions, no core. 10YR3/3

Sample no.	RPC-7493 (fabric VIII) 
Ware	RPC
Context	Context 963, LVII-1, Phase I
Shape	Cooking pot? Small closed, flaring, thinning, rounded rim. Single rim projection. Handle or rim projection. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: thin slip, slight lustre, no mottling, even burnishing, 7.5YR4/2-7.5YR3/2
Fabric	Fabric: hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 7.5YR4/4-3/4
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.5 cm.

Sample no.	WPP MA-7709 (fabric I)  
Ware	WPP
Context	Context 962, L-4, Phase F.
Shape	body, large closed,
Wall thickness	body 9.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Interior*: no slip. *Decoration*: painted. Herringbone pattern on exterior in red-brown paint (2.5YR4/6)
Fabric	medium-soft, fine texture; few small black and white inclusions; thick, dark core. 7.5YR6/4

Sample no.	WPP MA-7761 (fabric IV)  
Ware	WPP
Context	Context 989, L-13, Phase A.
Shape	body, large open
Wall thickness	body 8.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Interior*: medium slip, ? lustre, no mottling, 2.5YR5/6. *Decoration*: painted. Painted wavy line decoration on exterior. Solid slip or paint on interior (2.5YR5/6 to 2.5YR4/4)
Fabric	medium-hard, medium texture; few small red and white inclusions; thick, dark core. 7.5YR6/6-5/6

Sample no.	WPP MA-8551 (outlier) 
Ware	WPP
Context	Context 1148, LX-9, Phase D-1.
Shape	body, large closed
Wall thickness	Thick body sherd from closed vessel. Body 11.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Decoration*: painted. Exterior not slipped. Painted decoration in three distinct areas. Colour of paint 2.5YR4/6. Apparently thick wavy lines
Fabric	Medium-soft, very fine texture. Medium number of small + medium black, red and white inclusions; thick, dark core. 7.5YR6/6

Sample no.	RPC-9062 (fabric VIII) 
Ware	RPC
Context	Context 1277, IX-5, Phase G
Shape	Cooking pot. Large closed horizontal, round mouth. Straight, constant, rounded rim, widening neck. Rim almost flattened
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR3/3-5YR2.5/1. Discoloured due to exposure to carbons on exterior, penetrating into wall
Fabric	Hard, coarse texture; few small + medium white inclusions; thin, dark core. 5YR4/6
Wall thickness	Rim 0.5 cm.

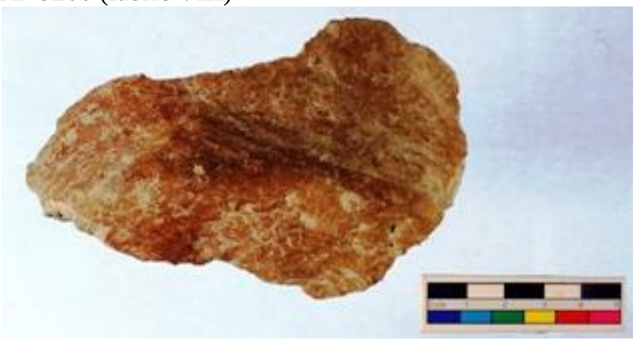
Sample no.	WPP MA-9112 (Outlier) 
Ware	WPP
Context	Context 1291, LXIII-4, Phase C.
Shape	Rim, small open, straight, thinning, rounded rim. RimD: general 100-200.
Wall thickness	Below rim 5, body 7.
Surface treatment / Decoration – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 10YR7/3. Interior: thin slip, matt lustre, no mottling, 10YR6/3. Decoration: painted. Paint colour 2.5YR4/4 and matt. Thin self-slip.
Fabric	Soft, very fine texture; few small black and red inclusions, no core. 10YR6/3-6/4

Sample no.	PRS MA-9121 (fabric I) 
Ware	PRS
Context	Context 1206, LXII-8, Phase D.
Shape	Body and base, large closed, flat base.
Wall thickness	body 9
Surface treatment / Decoration – Interior/Exterior	Exterior: worn slip, slight lustre, no mottling, even burnishing, 2.5YR4/6.
Fabric	Medium-soft, fine texture. Medium number of small red and white inclusions; thick, dark core. 7.5YR5/6

Sample no.	PRS MA-9173 (fabric IV) 
Ware	PRS
Context	Context 1292, LXIII-2, Phase D.
Shape	Body, large closed
Wall thickness	body 8.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR4/4. From shoulder of medium-sized closed vessel. Lower break (on all sherds) horizontal where vessel broke along an unsuccessful coil join. Outer edge of break smooth and flat where coil placed over lower one and did not bond. Inner edge of break jagged and extends deeper down vessel, where interior surface was pushed downward across coil join
Fabric	Medium-soft, medium texture; few small black, red and white inclusions; thin, light core. 7.5YR5/6

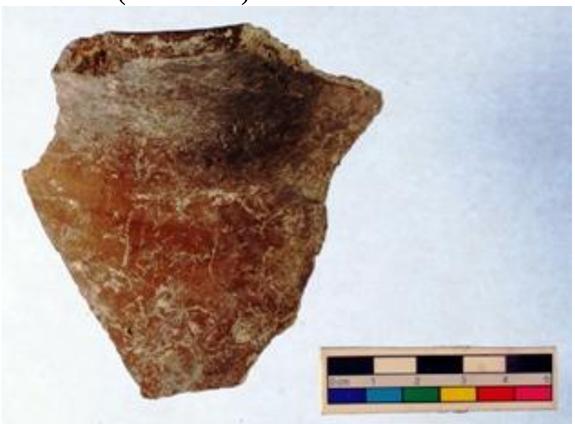
Sample no.	RPC-9176 (fabric VIII) 
Ware	RPC
Context	Context 1371, X-5, Phase G
Shape	Cooking pot - large closed, horizontal, round mouth. Flaring, thinning, rounded rim, unpierced lug, concave neck. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR3/2-5YR3/3
Fabric	Medium-hard, medium texture. Medium number of small red and white inclusions; thin, dark core. 7.5YR3/4
Wall thickness	Rim 0.4 cm.

Sample no.	CW-9186 (fabric IV) 
Ware	CW
Context	Context 1371, X-5, Phase G
Shape	Mealing bin large open straight, thinning, flattened rim. RimD: general >400.
Surface treatment – Interior/Exterior	Exterior: no slip. Interior: medium slip, medium lustre, no mottling, 2.5YR3/6
Fabric	Soft, coarse texture; few small + medium + large black, red and white inclusions. 7.5YR4/6
Wall thickness	Rim 0.8 cm, below rim 0.9 cm, body 2.3 cm.

Sample no.	RP-9200 (fabric VIII) 
Ware	RP
Context	Context 1287, IX-5, Phase G
Shape	Pithos, base + body, large closed, stump base.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 7.5YR5/4-2.5YR4/6
Fabric	hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 5YR3/4
Wall thickness	Base 3.1 cm.

Sample no.	CW-9207 (fabric II) 
Ware	CW
Context	Context 1287, IX-5, Phase G
Shape	Mealing bin, large open, straight, constant, rounded rim
Surface treatment – Interior/Exterior	Exterior: no slip. Interior: worn slip, matt lustre, no mottling, 10R4/4-10R4/6. Exterior formed against a vertical surface. Rim and interior slipped. Exterior not slipped
Fabric	Medium-soft, very coarse texture; few small + medium + large black, red and white inclusions. 7.5YR5/4
Wall thickness	Rim 0.8 cm, below rim 1.1 cm, body 1.3 cm.

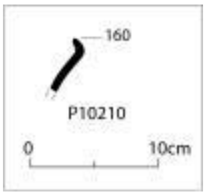
Sample no.	RP-9242 (fabric XI) 
Ware	RP
Context	Context 1377, IX-5, Phase G
Shape	rim, large open bowl, straight, constant, rounded rim. RimD: general 300-400, specific 360
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR5/4. Interior: medium slip, matt lustre, no mottling, 2.5YR5/4
Fabric	medium-hard, medium texture; few small black and white inclusions, no core. 2.5YR4/6
Wall thickness	rim 0.4 cm, below rim 0.6 cm, body 0. 8 cm.

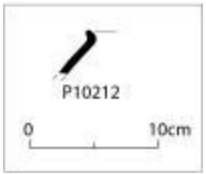
Sample no.	RPC-9243 (fabric VIII) 
Ware	RPC
Context	Context 1377, IX-5, Phase G
Shape	Cooking pot, rim+neck+body, large closed, horizontal, round mouth. Flaring, constant, flattened rim, widening neck. RimD: general 100-200, specific 200
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR3/4. Carbon discolouration near rim on exterior
Fabric	Hard, medium texture; few small + medium black and white inclusions; thin, light core. 5YR3/4
Wall thickness	Rim 0.5 cm, below rim 0.6 cm, body 0.4 cm.

Sample no.	RP-9248 (fabric VIII) 
Ware	RP
Context	Context 1377, IX-5, Phase G
Shape	Rim and neck and body, large closed, horizontal mouth, flaring, constant, flattened rim, concave neck. RimD: general 200-300. Possibly a cooking pot.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR4/4-2.5YR4/6
Fabric	Medium-hard, medium texture. Medium number of small white inclusions; thick, dark core. 5YR5/6
Wall thickness	Rim 0.5 cm, below rim 0.6 cm, body 0.8 cm.

Sample no.	PRS MA-9642 (fabric III) 
Ware	PRS
Context	Context 1443, XIX-2, Phase H.
Shape	Body and base, large closed, flat base. BaseD 50.
Wall thickness	Body 7, base 11.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR4/6.
Fabric	medium-soft, fine texture; few small black, red and white inclusions; thin, dark core. 10YR5/4

Sample no.	PRS MA-9724 (fabric III) 
Ware	PRS
Context	Context 1452, XIX-2, Phase H.
Shape	Handle and base, small open, incurved, constant wall. Pierced vertical lug. BaseD 30. RimD: general 100-200. Body height approx 40
Wall thickness	Below rim 6, body 7, base 7.
Surface treatment / Decoration – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR4/6. Interior: medium slip, matt lustre, no mottling, 5YR4/4. Coarsely-made bowl (small). Most of pierced vertical lug and rim broken away. Exterior and interior uneven and lumpy.
Fabric	Medium-soft, medium texture. Medium number of small red and white inclusions; thick, dark core. 10YR5/4

Sample no.	RPCP-10210 (fabric V)  
Ware	RPCP
Context	Context 1466, IX-12, Phase D
Shape	Cooking pot, rim and body, large closed, horizontal, round mouth. Straight, thinning, rounded rim. RimD: general 100-200, specific 160
Surface treatment – Interior/Exterior	Exterior: no slip. Thin self-slip or none at all on exterior. Well-smoothed exterior. Thick central dark core. Very gritty clay, with grits visible on surface. Some discolouration on exterior beginning toward lower end of sherd
Fabric	Hard, fine texture; few small + medium black and white inclusions; thick, dark core. 7.5YR4/6
Wall thickness	Rim 0.3 cm, below rim 0.5 cm, body 0.6 cm.

Sample no.	RPCP-10212 (fabric V)  
Ware	RPC
Context	Context 1466, IX-12, Phase D
Shape	Cooking pot., rim + body, large closed, horizontal, round mouth. Straight, thinning, rounded rim. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: no slip. Whole section black and both surfaces grey
Fabric	Hard, fine texture; few small black and white inclusions, no core. 2.5YR3/0
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.6 cm.

Sample no.	CW-10224 (fabric IV) 
Ware	CW
Context	Context 1552, XIII-14, Phase A
Shape	Mealing bin, rim + body, large open, straight, thinning, rounded rim. RimD: general >400
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 7.5YR7/4-7.5YR6/4. Interior: medium slip, matt lustre, no mottling, 7.5YR7/4-7.5YR6/4
Fabric	Medium-soft, coarse texture; few small + medium black and white inclusions, no core. 7.5YR4/6
Wall thickness	Rim 0.9 cm, below rim 1.2 cm, body 2.5 cm.

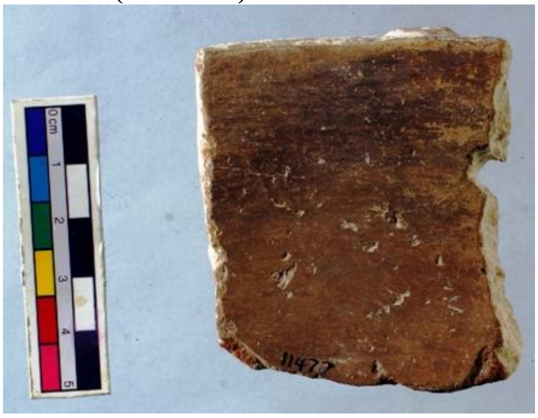
Sample no.	PRS MA-10234 (fabric II) 
Ware	PRS
Context	Context 1546, XIII-14, Phase A.
Shape	Rim and body, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 130.
Wall thickness	rim 3, below rim 4, body 7
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 10YR4/1. *Interior*: medium slip, matt lustre, no mottling, 10YR4/1.
Fabric	Medium-soft, fine texture; few small black and white inclusions, no core. 10YR5/3

Sample no.	RP-10242 (fabric IV) 
Ware	RP (Early RP)
Context	Context 1547, XIII-14, Phase A
Shape	Bowl, rim and body, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 120
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR4/6. Interior: medium slip, slight lustre, no mottling, 2.5YR4/6. Orange-brown mottled surface. Hard-fired.
Fabric	Hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 5YR5/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	RP-11341 (fabric X) 
Ware	RP
Context	Context 1733, XCV-1, Phase I
Shape	Bowl, rim and handle, small open, incurved, thinning, rounded rim. Horizontal, oval handle, from rim. RimD: general 100-200, specific 130. Handle somewhat distorted, probably due to mishap during manufacture.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, slight mottling, even burnishing, 2.5YR5/6. Interior: medium slip, slight lustre, no mottling, 2.5YR5/6
Fabric	Medium-hard, fine texture; few small black and white inclusions, no core. 5YR5/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	ERS-11353 (fabric XIII) 
Ware	ERS
Context	Context 1733, XCV-1, Phase I
Shape	Body sherd from large closed vessel with irregularly broken edges and mend hole, drilled from interior only. Broken through hole. L 94. W 49. Th 9. MinD of perforation 4.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR3/4-2.5YR2.5/0.
Fabric	Medium-soft, fine texture; few small + medium black and white inclusions, no core. 7.5YR7/4
Wall thickness	Body 0. 9 cm.

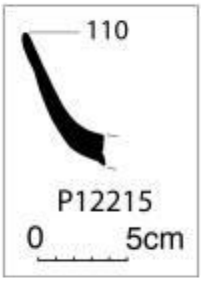
Sample no.	RP-11359 (fabric II) 
Ware	RP
Context	Context 1733, XCV-1.
Shape	Jug neck, large closed
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/6. Decoration: incised.
Fabric	Medium-soft, fine texture; few small + medium black inclusions, no core. 7.5YR5/6

Sample no.	RP-11477 (fabric VIII) 
Ware	RP
Context	Context 1753, CIII-1, Phase I.
Shape	Bowl, rim+handle, large open, straight, thinning, rim. Pierced ledge handle, from rim.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR6/6. Interior: medium slip, medium lustre, no mottling, 5YR5/4. Decoration: relief. Vertically pierced ledge with horizontal piercing through wall directly under where handle meets body. Relief dot (depressed in centre) on outer edge
Fabric	Medium-hard, medium texture. Medium number of small + medium white inclusions, no core. 2.5YR4/6
Wall thickness	Rim 0.5 cm, below rim 0.6 cm, body 1.1 cm.

Sample no.	RP-11478 (fabric VIII) 
Ware	RPC
Context	Context 1753, CIII-1, Phase I
Shape	Cooking pot, base+body, large closed, foot base. Elongated conical foot with tip damaged. L 54mm. W 29mm near body and 7mm at end
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 2.5YR4/4-2.5YR3/3
Fabric	Medium-hard, fine texture; few small + medium black and white inclusions; thick, dark core. 7.5YR4/4
Wall thickness	Body 0.7 cm.

Sample no.	ERS-11482 (fabric XIII) 
Ware	ERS
Context	Context 1753, CIII-1, Phase I
Shape	Bowl, rim, large open, incurved, thinning, flattened rim. RimD: general 300-400
Surface treatment – Interior/Exterior	Exterior: worn slip, ? lustre, no mottling, 7.5YR6/6. Interior: medium slip, matt lustre, no mottling, 5YR6/4
Fabric	Medium-soft, very fine texture; few small + medium black, red and white inclusions, no core. 7.5YR6/6
Wall thickness	Rim 0.5 cm, below rim 0.6 cm, body 0 9 cm.

Sample no.	RP-12193 (fabric XII) 
Ware	RP (Black-topped)
Context	Context 1894, XCIX-1, Phase I
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 120
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR2.5/0-5YR5/6. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0
Fabric	Soft, fine texture. Number of small black and white inclusions; thin, dark core. 10YR5/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

Sample no.	PRS MA-12215 (fabric III)  
Ware	PRS
Context	Context 1898, CI-6, Phase D.
Shape	incurved, thinning, rounded rim. rim, small open. RimD: general 100-200, specific 110.
Wall thickness	rim 3, below rim 5, body 17. Body thickness 9 to 17
Surface treatment / Decoration – Interior/Exterior	Exterior: worn slip, matt lustre, no mottling, 2.5YR5/6. Interior: medium slip, matt lustre, no mottling, 2.5YR6/6.
Fabric	medium-soft, medium texture. Medium number of small + medium black and white inclusions, no core. 7.5YR5/6 Probably PRS. Fired soft to medium-soft.

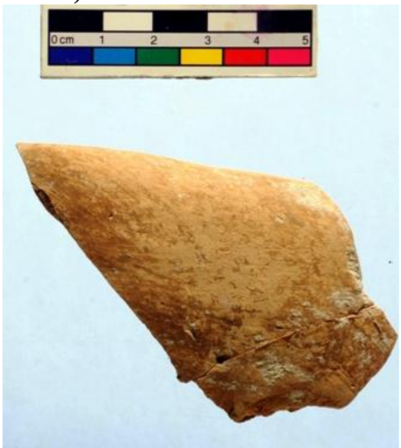
Sample no.	RP-12239 (fabric X) 
Ware	RP
Context	Context 1919, XCIX-1, Phase I
Shape	Bowl, rim, large open, incurved, thinning, rounded rim. RimD: general 300-400
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, medium mottling, even burnishing, 2.5YR5/6. Interior: medium slip, slight lustre, no mottling, 2.5YR5/6
Fabric	Medium-hard, fine texture; few small black and white inclusions, no core. 7.5YR5/6
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.8 cm.

Sample no.	ERS-12353 (fabric XIII) 
Ware	ERS
Context	Context 1930, XCIX-1, Phase I
Shape	Bowl, rim, large open, incurved, thinning, rounded rim. RimD: general 200-300.
Surface treatment – Interior/Exterior	Exterior: thin slip, slight lustre, no mottling, even burnishing, 7.5YR6/6 Interior: thin slip, matt lustre, no mottling, 7.5YR4/1-7.5YR4/2. Interior and exterior slip very thin, flaking
Fabric	Medium-hard, very fine texture; few small black and white inclusions, no core. 5YR5/6-6/6
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.8 cm.

Sample no.	RP-12359 (fabric VII) 
Ware	RP (black-topped)
Context	Context 1924, CIV-3, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 140
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 5YR5/8 Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0
Fabric	Soft, very fine texture; few small black and white inclusions; thin, dark core. 10YR6/4
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

Sample no.	RP-12361 (fabric II) 
Ware	RP
Context	Context 1924, CIV-3, Phase F
Shape	neck, large closed
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 10R4/4-10R3/4. Double vertical disconnected zigzag on neck. Incision shallow, with slip inside. Coarse incision
Fabric	Medium-hard, medium texture. Medium number of small + medium black, red and white inclusions, no core.5YR5/6

Sample no.	RP-12372 (Outlier) 
Ware	RP (black-topped)
Context	Context 1804, CII-3, Phase F
Shape	Bowl. body, small open
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, medium mottling, even burnishing, 5YR5/6-5YR5/8 Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0. Decoration: incised. Finely incised pattern of concentric circles joined by four straight lines
Fabric	Medium-soft, fine texture; few small + medium black and white inclusions, no core. 10YR6/6
Wall thickness	Body 0. 6 cm.

Sample no.	RP-12456 (fabric XIII)  
Ware	ERS
Context	Context 1957, XCIX-1, Phase I
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 180.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 7.5YR6/4-7.5YR5/4. Interior: worn slip, slight lustre, no mottling, 7.5YR4/3. Thin, washy slip, showing underlying fabric.
Fabric	Medium-soft, fine texture; few small + medium black and white inclusions, no core. 5YR6/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	RP-12458 (fabric VIII) 
Ware	RP
Context	Context 1957, XCIX-1, Phase I
Shape	Rim and neck, small closed, horizontal mouth. Flaring, thinning, rounded rim, unpierced lug, widening neck.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/2-5YR3/2. Interior: medium slip, medium lustre, no mottling, 5YR4/2-5YR4/3. Small elongated lug from mid-neck to upper body
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thin, light core. 5YR4/6

Sample no.	RP-12473 (fabric IV) 
Ware	RP
Context	Context 1855, CII-5, Phase D
Shape	Bowl, rim+body, small open, incurved, thinning, rounded rim. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 10YR3/1-5YR4/4. Interior: medium slip, slight lustre, no mottling, 5YR4/6-10YR3/1
Fabric	Hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR4/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.

Sample no.	RP-12800 (fabric IV) 
Ware	RP
Context	Context 2131, CIV-4, Phase E
Shape	Bowl, rim and handle, small open, incurved, thinning, rounded rim, horizontal handle, below rim. RimD: general 100-200, specific 110
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 7.5YR5/4. Interior: medium slip, matt lustre, no mottling, 7.5YR5/4.
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 7.5YR4/6
Wall thickness	Rim 0.2 cm, below rim 0.4 cm, body 0.8 cm.

Sample no.	RP-12811 (Outlier) 
Ware	RP (black-topped)
Context	Context 2135, XCVIII-5, Phase G
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 160
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 7.5YR5/6-2.5YR2.5/0. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0
Fabric	Medium-soft, fine texture; few small black and white inclusions, dark core. 10YR6/4
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.7 cm.

Sample no.	RP-12823 (fabric VIII) 
Ware	RPC
Context	Context 2116, XCIII-1, Phase I
Shape	Cooking pot, rim and neck, large closed, round mouth. Flaring, constant, flattened rim. Concave neck
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 10YR4/3.
Fabric	Hard, medium texture; few small + medium black, red and white inclusions; thick, dark core. 5YR4/3
Wall thickness	Rim 0.3 cm, below rim 0.4 cm, body 0.5 cm.

Sample no.	RP-12841 (fabric II) 
Ware	RP
Context	Context 2102, CIII-6, Phase F
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 180
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR4/6. Interior: medium slip, medium lustre, no mottling, 2.5YR4/6
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 10YR6/4 Fired medium-soft to medium-hard
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

Sample no.	RP-12933 (fabric X) 
Ware	RP
Context	Context 2101, XCVIII-4, Phase H
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 140
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, medium mottling, even burnishing, 2.5YR4/6. Interior: medium slip, medium lustre, no mottling, 2.5YR4/6
Fabric	Medium-hard, medium texture; few small + medium black and white inclusions; thin, light core. 5YR5/4
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0. 8 cm.

Sample no.	RPC-12940 (fabric IV) 
Ware	RPC
Context	Context 2164, XCIX-4, Phase F
Shape	Cooking pot, base, large closed, Foot base. Low foot. Estimated L approx 25
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, slight mottling, 2.5YR4/6. Interior: thin slip, matt lustre, no mottling, 2.5YR5/6
Fabric	Hard, medium texture; few small + medium black, red and white inclusions; thick, dark core. 7.5YR5/6
Wall thickness	body 0.8 cm.

Sample no.	RPC-12942 (fabric VIII) 
Ware	RPC
Context	Context 2164, XCIX-4, Phase F
Shape	Cooking pot? base, large closed, <1/3 preserved. flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR4/4. Interior: thin slip, matt lustre, no mottling, 5YR3/3. Possibly an early RP cooking pot base. Interior slipped and discoloured black
Fabric	Medium-hard, medium texture; few medium black, red and white inclusions; thin, dark core. 5YR4/6
Wall thickness	Body 0.4 cm, base 0.3 cm.

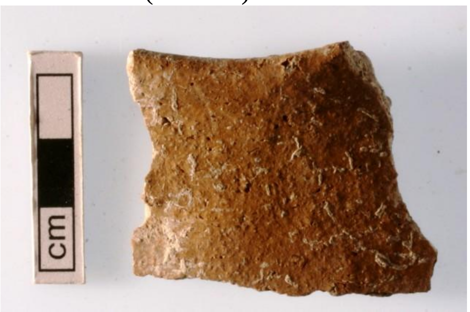
Sample no.	RP-12944 (fabric II) 
Ware	RP.
Context	Context 2164, XCIX-4, Phase F
Shape	Rim and handle, small closed, flaring, thinning, rounded rim, vertical handle.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 5YR4/3
Fabric	Medium-hard, medium texture; few small black and white inclusions, no core. 7.5YR4/6
Wall thickness	rim 0.1 cm, below rim 0.2 cm, body 0.9 cm.

Sample no.	RP-12954 (fabric VIII) 
Ware	RP
Context	Context 2165, XCIX-3, Phase G
Shape	Bowl. Rim, large open, Incurved, thinning, rounded rim. RimD: general 200-300.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, medium mottling, even burnishing, 2.5YR4/8. Interior: medium slip, medium lustre, no mottling, 2.5YR4/6
Fabric	Medium-hard, medium texture; few small black and white inclusions; thick, light core. 7.5YR5/6
Wall thickness	Rim 0.2 cm, below rim 0.4 cm, body 1.0 cm.

Sample no.	RP-13007 (fabric VIII) 
Ware	RP
Context	Context 2142, XCVIII-5, Phase G
Shape	Bowl, rim, large open, incurved, thinning, flattened rim
Surface treatment – Interior/Exterior	Exterior: thin slip, slight lustre, no mottling, even burnishing, 2.5YR3/2. Interior: medium slip, medium lustre, no mottling, 5YR4/6
Fabric	Hard, medium texture; few small black, red and white inclusions, no core. 2.5YR4/6, Fired medium-hard to hard
Wall thickness	rim 0.2 cm, below rim 0.5 cm, body 1.1 cm.

Sample no.	RPCP-13016 (fabric VIII) 
Ware	RPC
Context	Context 2195, CIII-13, Phase A.
Shape	Cooking pot? Rim + neck, large closed, flaring, thinning, flattened rim, upward tapering neck.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 7.5YR5/4.
Fabric	Hard, coarse texture; few medium + large black, red and white inclusions, no core. 5YR4/6. Fire-cracked surfaces, possibly caused during firing rather than use. Fired hard to very hard
Wall thickness	Rim 0.4 cm, below rim 0.6 cm, body 0.7 cm.

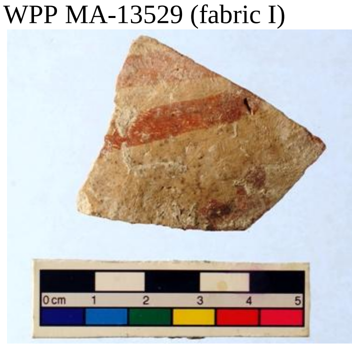
Sample no.	RP-13025 (Outlier) 
Ware	RP (black-topped)
Context	Context 2190, XCVII-7, Phase F
Shape	Bowl, small open, incurved, thinning, rounded rim. Plain lug handle, below rim. RimD: general 100-200, specific 160
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, slight mottling, even burnishing, 5YR4/4. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0
Fabric	Medium-soft, fine texture; few small + medium black, red and white inclusions; thin, dark core. 10YR7/4
Wall thickness	Rim 0.1 cm, below rim 0.3 cm, body 0.5 cm.

Sample no.	RPCP-13105 (fabric V) 
Ware	RPC
Context	Context 2222, XCVIII-12, Phase A
Shape	Cooking pot, rim, large closed, horizontal, round mouth. Straight, constant, rounded rim.
Surface treatment – Interior/Exterior	Exterior: worn slip, matt lustre, no mottling, 7.5YR5/4.
Fabric	Hard, medium texture; few small + medium black and white inclusions; thick, dark core. 5YR4/4 Fired medium-hard to hard
Wall thickness	Rim 0.2 cm, below rim 0.4 cm, body 0.5 cm.

Sample no.	RPCP-13140 (fabric V) 
Ware	RPC
Context	Context 2233, XCVIII-12, Phase A
Shape	Cooking pot, rim, large closed, horizontal, round mouth. Flaring, thinning, rounded rim. RimD: general 100-200, specific 140. Very thin-walled on upper body.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 7.5YR5/4. No discolouration.
Fabric	Hard, fine texture; few small + medium black and white inclusions; thick, dark core. 7.5YR4/6 Many inclusions visible in section and on surfaces. Fired medium-hard to hard.
Wall thickness	Rim 0.2 cm, below rim 0.4 cm, body 0.4 cm.

Sample no.	RPCP-13147 (fabric VIII) 
Ware	RPC
Context	Context 2250, XCVIII-12, Phase A
Shape	Cooking pot, rim, large closed, horizontal, round mouth. Flaring, constant, rounded rim RimD: general 100-200, specific 190. Probably a cooking vessel, but not typical RPCP fabric or rim type.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 10YR4/2. Slipped on interior Discoloured grey, with whitish interior.
Fabric	medium-hard, medium texture; few small + medium black and white inclusions, no core. 10YR5/3. Heavy buildup in patches of grey substance on exterior, particularly in area approx 1cm below rim.
Wall thickness	Rim 0.5 cm, below rim 0.7 cm, body 0.7 cm.

Sample no.	HOB-13262 (fabric VI)  
Artefact type	hob
Context	Context 2178, XCVI-4, Phase G
Shape	Arm fragment, rising to terminal.
Surface treatment – Interior/Exterior	Exterior: no slip.
Fabric	Soft, fine texture. Medium number of small + medium black and white inclusions, no core. 10YR6/3. Fine soft fabric (10YR6/3) with medium number of small and medium black and white inclusions.10YR6/3

Sample no.	WPP MA-13529 (fabric I) 
Ware	WPP
Context	Context 2304, XCVII-9, Phase C.
Shape	RimD: general 200-300. Rim body, large open. Incurved, constant, rounded rim.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Interior*: no slip. *Decoration*: painted. Exterior may have a very thin matt slip, the same colour as fabric. Decoration applied in approx 5mm wide lines in matt 2.5YR4/6 paint. Three non-joining fragments. Painted on exterior and, to a lesser extent, on interior. Horizontal band at rim on interior.
Fabric	Medium-soft, fine texture; few small + medium black, red and white inclusions; thin, light core. 10YR6/4
Wall thickness	body 0.5 cm.

Sample no.	LOOM-13585 (fabric VI) 
Artefact type	loomweight
Context	Context 2317, XCVI-5, Phase F
Fabric	Medium-soft, coarse texture; few small + medium + large black and white inclusions. 10YR6/4

Sample no.	LOOM-13829 (fabric VI) 
Artefact type	loomweight
Context	Context 2359, XCVI-5, Phase F
Fabric	Soft, medium texture. Medium number of small + medium black, red and white inclusions, no core. 10YR6/4

Sample no.	RP-14053 (fabric XII) 
Ware	RP (black-topped)
Context	Context 2436, XCIV-2, Phase F
Shape	Bowl, body, small open
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 5YR5/6. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0. Decoration: incised, Motif probably linked concentric circles. Glossy black interior.
Fabric	Soft, very fine texture; few small black and white inclusions; thick, light core. 7.5YR6/6
Wall thickness	Body 0.5 cm.

Sample no.	RP-14097 (fabric IV) 
Ware	RP
Context	Context 2450, XC-5, Phase E
Shape	Jar, rim, large closed, horizontal, round mouth. Flaring, thinning, flattened rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/4. Interior slipped, 2.5YR4/6
Fabric	Medium-hard, medium texture. Medium number of small + medium black, red and white inclusions; thin, light core. 5YR4/6
Wall thickness	Rim 0.3 cm, below rim 0.4 cm, body 1.0 cm.

Sample no.	RP-14204 (fabric X) 
Ware	RP
Context	Context 2526, CIX-2, Phase G
Shape	Small open, incurved, thinning, pointed rim. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, medium mottling, even burnishing, 5YR5/6. Interior: thin slip, slight lustre, no mottling, 7.5YR5/4
Fabric	Medium-soft, fine texture; few small white inclusions, no core. 7.5YR5/4
Wall thickness	rim 0.1 cm, below rim 0.2 cm, body 0.9 cm.

Sample no.	RP-14225 (fabric IV) 
Ware	RP
Context	Context 2487, XCVI-10, Phase C
Shape	Large closed, horizontal, round mouth. Flaring, thinning, rounded rim.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR5/6
Fabric	Hard, medium texture; few small + medium black, red and white inclusions; thick, light core. 5YR4/6
Wall thickness	Rim 0.3 cm, below rim 0.8 cm, body 0.9 cm.

Sample no.	RP-14262 (fabric VI) 
Ware	RP
Context	Context 2615, XCIII-7, Phase D
Shape	Pan, rim+base, large open, straight, thinning, rounded rim. Flange base. General 200-300, specific 260
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 7.5YR4/3. Interior: medium slip, high lustre, no mottling, 2.5YR4/6. Exterior slip extends only 3-4 from rim down wall of vessel. Interior slip worn but areas of high gloss remain. No dark discolouration on interior. Slight flange along part of base edge. Some punctures. One visible in base, others in section. Punctures probably made with an instrument rectangular in section (1x2 and approx 7 deep).
Fabric	Medium-soft, medium texture. Medium number of small + medium black, red and white inclusions, no core. 10YR5/4
Wall thickness	Rim 0.3 cm, below rim 0.5 cm, body 0. 9 cm.

Sample no.	PRS MA-14280 (outlier) 
Ware	PRS
Context	Context 2535, XC-10, Phase C.
Shape	base, large closed, flat base.
Wall thickness	body 8.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, ? lustre, no mottling. Slip worn completely from exterior
Fabric	medium-hard, medium texture. Medium number of small + medium black, red and white inclusions; thick, dark core. 7.5YR4/6

Sample no.	RP-14313 (fabric II) 
Ware	RP
Context	Context 2563, XCV-3, Phase G
Shape	Large closed, flaring, constant, flattened rim. RimD: general 100-200, specific 140
Surface treatment – Interior/Exterior	Exterior: worn slip, medium lustre, no mottling, even burnishing, 2.5YR4/6
Fabric	Medium-hard, fine texture; few small + medium black and white inclusions, no core. 7.5YR5/4
Wall thickness	Rim 0.5 cm, below rim 0.7 cm, body 0.7 cm.

Sample no.	PRS MA-14323 (fabric III) 
Ware	PRS
Context	Context 2592, XC-10, Phase C.
Shape	base, large closed, flat base. BaseD 50.
Wall thickness	body 12
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 2.5YR4/6.
Fabric	Medium-soft, medium texture. Medium number of small + medium + large black and white inclusions. thick, light core. 7.5YR5/4

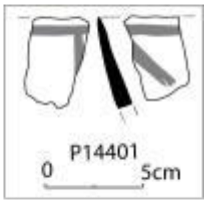
Sample no.	PRS MA-14338 (burnt) 
Ware	PRS
Context	Context 2577, CIIA-3, Phase B.
Shape	Rim and neck and handle, large closed, cut-away mouth. Flaring, thinning rounded rim. Low vertical, round handle, from mid-neck. Widening neck. HandleD 26 x 27.
Wall thickness	rim 2, below rim 3
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, slight lustre, no mottling, irregular burnishing, 10YR5/4.
Fabric	Medium-hard, medium texture. Medium number of small + medium + large black and white inclusions. thick, dark core. 7.5YR5/6

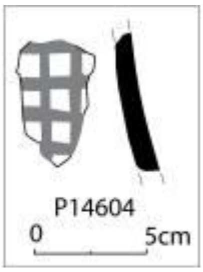
Sample no.	RPC-14347 (fabric VIII) 
Ware	RPC
Context	Context 2590, CIX-4, Phase E
Shape	Cooking pot, rim+handle, large closed, horizontal mouth. Flaring, thinning, rounded rim. High vertical, oval handle, from rim. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: worn slip, no mottling, 5YR5/4. Surfaces discoloured
Fabric	Medium-hard, medium texture. Medium number of small + medium black, red and white inclusions, no core. 5YR3/3, Fabric fired dark through section.
Wall thickness	Rim 0.4 cm, below rim 0.5 cm, body 0.9 cm.

Sample no.	RP-14354 (Outlier) 
Ware	RP
Context	Context 2494, XCVI-10, Phase C
Shape	Large closed, Base is not truly flat.
Surface treatment – Interior/Exterior	Exterior: worn slip, medium lustre, no mottling, even burnishing, 7.5YR5/6
Fabric	Medium-hard, medium texture. Medium number of small + medium + large black and white inclusions. 10YR5/3. Fabric fired dark through section

Sample no.	RP-14377 (fabric XI) 
Ware	RP (Early RP)
Context	Context 2606, XCVI-12, Phase B
Shape	Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 140
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/3. Interior: medium slip, slight lustre, no mottling, 5YR4/3
Fabric	Medium-hard, medium texture. Medium number of small + medium black, red and white inclusions, no core. 5YR4/6
Wall thickness	Rim 0.1 cm, below rim 0.2 cm, body 0.5 cm.

Sample no.	RP-14379 (fabric IV) 
Ware	RP (Early RP)
Context	Context 2606, XCVI-12, Phase B
Shape	Jar. rim, small closed, horizontal, round mouth. Flaring, thinning, rounded rim. RimD: general 100-200
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/2. Good slip across interior
Fabric	Hard, medium texture. Medium number of small + medium black, red and white inclusions; thick, light core. 7.5YR5/6
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.6 cm.

Sample no.	WPPMA-14401(fabric II) 
Ware	WPP
Context	Context 2619, XC-11, Phase B-1.
Shape	rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.
Wall thickness	rim 2, below rim 3, body 8.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: worn slip, matt lustre, no mottling. *Decoration*: painted. Faint traces of paint on interior and exterior. Possibly thin self slip. Fine smoothing marks very clear. Paint matt (7.5YR5/4). Fired soft to medium-soft.
Fabric	soft, fine texture; few small + medium black and white inclusions, no core. 10YR5/2

Sample no.	WPP MA-14604 (outlier) 
Ware	WPP
Context	Context 2690, CIX-11, Phase A.
Shape	uncertain vessel type
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Decoration*: painted. Incised motifs, fine incision. Thick-walled sherd. Surface well-smoothed but no indication of slip. Paint is matt and 10R4/6. On interior small area of slip at one short end of sherd, and some tiny traces elsewhere
Fabric	medium-soft, very fine texture; few small black, red and white inclusions; thin, light core. 7.5YR7/6

Sample no.	RP-14957 (Outlier) 
Ware	RP (black-topped)
Context	Context 2778, CXXII-1, Phase I
Shape	Bowl, rim and body, small open, incurved, thinning, rounded rim. RimD: general 100-200, specific 160
Surface treatment – Interior/Exterior	Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR2.5/0-5YR5/6. Interior: medium slip, high lustre, no mottling, 2.5YR2.5/0. On exterior black band extends approx 32 from rim. Glossy black interior
Fabric	Medium-soft, fine texture; few small black, red and white inclusions; thin, light core. 10YR6/4
Wall thickness	Rim 0.1 cm, below rim 0.3 cm, body 0.6 cm.

Sample no.	RP-14958 (fabric IX) 
Ware	RP
Context	Context 2778, CXXII-1, Phase I
Shape	Cooking vessel or jar. rim+neck, large closed, horizontal, round mouth. Flaring, thinning, rounded rim. RimD: general <100, specific 80. Short broad neck.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 7.5YR3/2. Matt slip on interior of rim.
Fabric	Medium-hard, fine texture; few small black, red and white inclusions; thin, light core. 7.5YR4/3
Wall thickness	Rim 0.1 cm, below rim 0.3 cm, body 0.7 cm.

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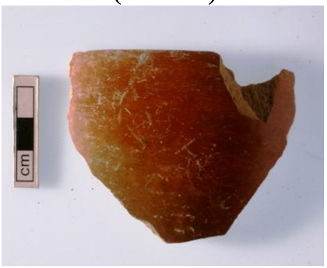
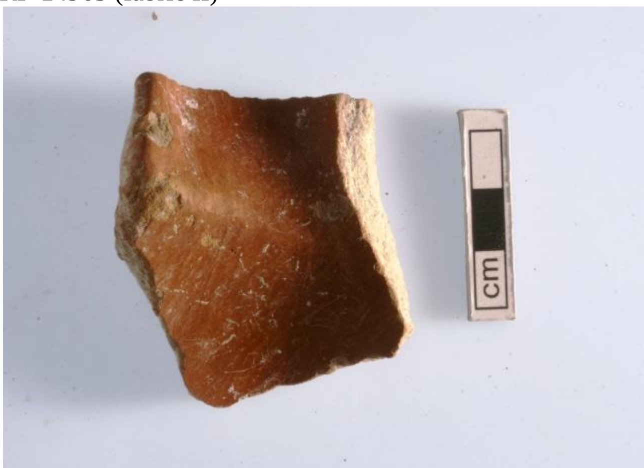
<tr><td>Sample no.</td><td>RP-14961 (fabric II)
</td></tr>
<tr><td>Ware</td><td>RP</td></tr>
<tr><td>Context</td><td>Context 2717, XCIII-7, Phase D</td></tr>
<tr><td>Shape</td><td>Bowl, rim, small open, incurved, thinning, rounded rim. RimD: general 100-200.</td></tr>
<tr><td>Surface treatment – Interior/Exterior</td><td>Exterior: medium slip, high lustre, no mottling, even burnishing, 2.5YR5/6-2.5YR4/6.
Interior: medium slip, high lustre, no mottling, 2.5YR5/6-2.5YR4/6</td></tr>
<tr><td>Fabric</td><td>Medium-soft, fine texture; few small black, red and white inclusions, no core. 10YR6/6</td></tr>
<tr><td>Wall thickness</td><td>Rim 0.1 cm, below rim 0.2 cm, body 0.6 cm.</td></tr>
</table>

<table>
<tr><td>Sample no.</td><td>RP-14963 (fabric II)
</td></tr>
<tr><td>Ware</td><td>RP</td></tr>
<tr><td>Context</td><td>Context 2651, XCIII-4, Phase E</td></tr>
<tr><td>Shape</td><td>Spouted bowl. large open, incurved, thinning, rounded rim and open spout</td></tr>
<tr><td>Surface treatment – Interior/Exterior</td><td>Exterior: medium slip, high lustre, no mottling, even burnishing, 10R4/6.
Interior: medium slip, high lustre, no mottling, 10R5/6</td></tr>
<tr><td>Fabric</td><td>Medium-hard, fine texture. Medium number of small black and white inclusions, no core. 7/5YR5/6</td></tr>
</table>

Sample no.	RPCP-15163 (fabric IV) 
Ware	RPC
Context	Context 2789, XCVIII-11, Phase C
Shape	Cooking pot, large closed, flat base.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR5/3. Interior very dark brown/black from extensive carbon residues (5YR2.5/1). Exterior of base has traces of slip but is worn. No discolouration on exterior.
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 7.5YR5/4
Wall thickness	Base 1.0 cm.

Sample no.	RPC-15183 (fabric VIII) 
Ware	RPC
Context	Context 2786, CXII-6, Phase E
Shape	Cooking pot. Large closed, horizontal, round mouth. Flaring, thinning, flattened rim, widening neck. RimD: general 200-300, specific 200
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 2.5YR4/4. Interior slipped and lightly burnished
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR4/3
Wall thickness	Rim 0.4, below rim 0.6 cm.

<table>
<tr><td>Sample no.</td><td>WPP MA-15242 (fabric I)
</td></tr>
<tr><td>Ware</td><td>WPP</td></tr>
<tr><td>Context</td><td>Context 2796, CVI-10, Phase B.</td></tr>
<tr><td>Shape</td><td>Spouted bowl.
rim+base+spout, small open, <1/3 preserved. 4 fragments.
Incurved, thinning, rounded rim.
Flat base.
RimD: general 100-200, specific 120.</td></tr>
<tr><td>Wall thickness</td><td>rim 2, below rim 3, body 5, base 7. BaseD 40.</td></tr>
<tr><td>Surface treatment / Decoration – Interior/Exterior</td><td>Exterior: no slip. Interior: no slip. Decoration: painted. Incised motifs, fine incision. Paint matt, 10R4/4 and flaking. Surface very well smoothed but no evidence of slip. Very soft fired. Horizontal band on exterior rim and traces of narrow band below rim on interior, below rim and on lower body vertical bands of crosshatching and possibly, on lower body, a set of vertical lines with angled short lines to one side. On upper body single vertical line and possibly set of three or more parallel vertical wavy lines. Decoration extends over base. Seems to be four plus parallel lines, with line also around edge of base. D of rim ca 120. Possibly evidence of a thin self slip on interior. Fourth non-joining fragment appears to have beginning of opening to narrow uptilted probably tubular spout.</td></tr>
<tr><td>Fabric</td><td>Soft, very fine texture; few small + medium black and white inclusions, no core. 10YR6/6</td></tr>
</table>

<table>
<tr><td>Sample no.</td><td>PRS MA-15277 (outlier)
</td></tr>
<tr><td>Ware</td><td>PRS</td></tr>
<tr><td>Context</td><td>Context 2796, CVI-10, Phase B.</td></tr>
<tr><td>Shape</td><td>Rim and body, large open, incurved, thinning, rounded rim.
RimD: general 200-300, specific 260.</td></tr>
<tr><td>Wall thickness</td><td>Rim 3, below rim 4, body 11.</td></tr>
<tr><td>Surface treatment / Decoration – Interior/Exterior</td><td>Exterior: medium slip, matt lustre, no mottling, 7.5YR5/4.
Interior: medium slip, matt lustre, no mottling, 5YR5/6.
Slip worn on both surfaces. Deep bowl.</td></tr>
<tr><td>Fabric</td><td>Medium-soft, fine texture. Medium number of small + medium black, red and white inclusions, no core. 10YR7/4</td></tr>
</table>

Sample no.	RPCP-15301 (fabric V) 
Ware	RPC
Context	Context 2724, CVI-10, Phase B
Shape	Cooking pot - large closed, horizontal, round mouth. Everted, thinning, rounded rim. RimD: general 100-200, specific 140
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 2.5YR5/4.
Fabric	Hard, medium texture. Medium number of small black and white inclusions, no core. 7.5YR4/3 Many small white and grey inclusions visible on surface. Carbon discolouration on interior of rim and upper body. Some brown inclusions
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.7 cm.

Sample no.	RPCP-15303 (fabric V) 
Ware	RPC
Context	Context 2724, CVI-10, Phase B
Shape	Cooking pot, large closed, vertical, handle, below rim.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 7.5YR5/4.
Fabric	Hard, medium texture; few small black and white inclusions; thick, dark core. 7.5YR5/4. Many small white inclusions. Fired medium-hard to hard
Wall thickness	Body 0.6 cm.

Sample no.	RPCP-15305 (fabric IV) 
Ware	RPC
Context	Context 2724, CVI-10, Phase B
Shape	cooking pot, large closed, flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/1-5YR4/2 Exterior slip worn in parts on base which appears to have a rough surface. Interior also slipped and matt with dark discolouration, 7.5YR3/1
Fabric	Medium-hard, medium texture. Medium number of small black and white inclusions; thin, light core. 7.5YR4/3
Wall thickness	Body 0.8 cm, base 0.7 cm.

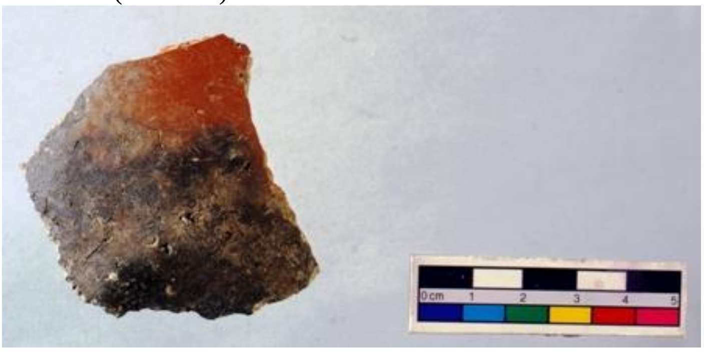
Sample no.	RPC-15382 (fabric VIII) 
Ware	RPC
Context	Context 2815, CXII-6, Phase E
Shape	Large closed, cooking pot. Foot base
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 5YR4/3. Matt slip on interior (5YR5/2) with a distinct area of carbon discolouration.
Fabric	Hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR5/6
Wall thickness	base 0.8 cm.

Sample no.	RP-15450 (fabric VIII) 
Ware	RP
Context	Context 2811, XC-7, Phase D
Shape	Large closed shape. Horizontal, round mouth. Flaring, thinning, flattened rim.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR4/4-2.5YR4/6. Matt slip on interior.
Fabric	Hard, fine texture; few small black and white inclusions, no core. 5YR4/6. Fired medium-hard to hard
Wall thickness	Rim 0.2 cm, below rim 0.4 cm, body 0.5 cm.

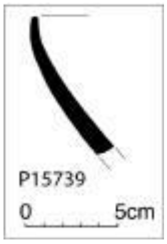
Sample no.	RP-15481 (fabric IX) 
Ware	RP
Context	Context 2793, CXXI-1, Phase I.
Shape	Large closed-Probably from shoulder.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR5/6-2.5YR4/6. Decoration: incised. Small fragment of lower handle on interior where pushed through wall. Sherd flares toward upper handle join. Possible white in-fill. Incision quite broad and V-shaped in section. A vertical one-line zigzag. Interior dark grey/black.
Fabric	Medium-soft, fine texture; few small + medium black and white inclusions; thin, dark core. 7.5YR6/6. Some grey inclusions.
Wall thickness	Body 0.6 cm.

Sample no.	RPCP-15638 (fabric V)  
Ware	RPC
Context	Context 2958, CXIV-5, Phase C
Shape	large closed, storage jar
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 7.5YR5/4. Slip worn along handle.
Fabric	Hard, medium texture; few small black and white inclusions; thin, dark core. 7.5YR4/6-5/6 Many inclusions in fabric.
Wall thickness	Body 0.7 cm.

Sample no.	RPCP-15640 (fabric IV) 
Ware	RPC
Context	Context 2958, CXIV-5, Phase C
Shape	Large closed, cooking pot. Horizontal, round mouth. Flaring, constant, rounded rim. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, matt lustre, no mottling, 2.5YR4/3-2.5YR4/4. Dark discolouration on exterior (5YR3/2). Matt slip on interior of rim. Rough surfaces, thick-walled.
Fabric	Hard, medium texture. Medium number of small black and white inclusions, no core. 7.5YR4/3. Fired medium-hard to hard.
Wall thickness	rim 0.2 cm, below rim 0.4 cm, body 1.1 cm.

Sample no.	RP-15646 (fabric IV) 
Ware	RP
Context	Context 2958, CXIV-5, Phase C
Shape	Bowl, body+base, small open, flat base.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR5/6-2.5YR4/6. Interior: medium slip, medium lustre, no mottling, 2.5YR5/6. Crackled interior and some spalling.
Fabric	Hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR5/6. Gritty orange fabric.
Wall thickness	Body 0.5 cm, base 0.4 cm.

Sample no.	RP-15649 (Outlier) 
Ware	RP
Context	Context 2958, CXIV-5, Phase C
Shape	Small open, bowl. flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR4/4. Interior: medium slip, medium lustre, no mottling, 5YR4/3-5YR4/4. Slight crackling on interior.
Fabric	Hard, medium texture; few small black and white inclusions; thick, dark core. 7.5YR4/3. Fired medium-hard to hard
Wall thickness	Body 0.7 cm, base 0.4 cm.

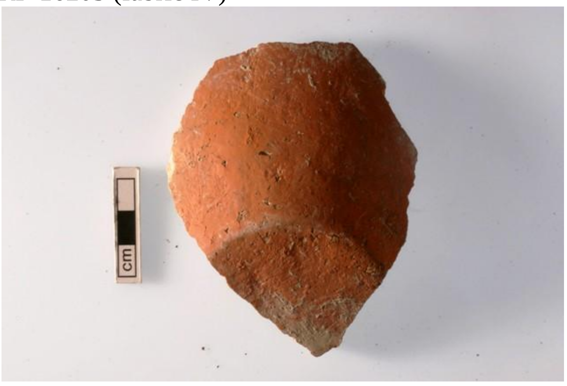
Sample no.	ERS-15739 (fabric XIII)  
Ware	ERS
Context	Context 3004, CXXIII-3, Phase H
Shape	Large open, bowl incurved, thinning, flattened rim. RimD: general 200-300, specific 270
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 7.5YR6/4-7.5YR6/6. Interior: medium slip, slight lustre, no mottling, 7.5YR6/4-7.5YR6/6. Slight discolouration on exterior. Slip worn along inner margin of rim. Texture very fine to fine
Fabric	Medium-soft, very fine texture; few small black and white inclusions, no core. 7.5YR6/6-6/4
Wall thickness	Rim 0.2 cm, below rim 0.3 cm, body 0.8 cm.

Sample no.	RP-15770 (fabric VIII) 
Ware	RP
Context	Context 3010, CXXI-5, Phase D
Shape	Small open, bowl. incurved, thinning, rounded rim. RimD: general 100-200, specific 120
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 5YR5/4 Interior: medium slip, medium lustre, no mottling, 2.5YR5/4-2.5YR4/4
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR5/6
Wall thickness	rim 0.2 cm, below rim 0.4 cm, body 0.8 cm.

Sample no.	RPC-16175 (fabric IV) 
Ware	RPC
Context	Context 3096, XCIII-7, Phase D
Shape	Large closed, cooking pot. Early RP cooking vessel.
Surface treatment – Interior/Exterior	Exterior: thin slip, matt lustre, no mottling, 2.5YR4/4. Carbon discolouration on interior and exterior which are also crackled from firing. Interior slipped.
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 5YR3/1-3/2 Medium-sized grey and some brown inclusions.
Wall thickness	Body 0.8 cm, base 1.0 cm.

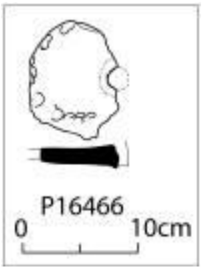
Sample no.	RPC-16194 (fabric VIII) 
Ware	RPC
Context	Context 3020, XCIII-7, Phase D
Shape	Large closed, cooking pot. horizontal, round mouth. Flaring, thinning, rounded rim. RimD: general 100-200, specific 160.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 5YR4/2-5YR3/2. Carbon discolouration on exterior and interior. Interior slipped, 5YR4/2
Fabric	medium-hard, fine texture. Medium number of small black and white inclusions, no core. 5YR3/1-3/2. Some brown inclusions
Wall thickness	rim 0.3 cm, below rim 0.4 cm, body 0.7 cm.

Sample no.	RP-16199 (Outlier) 
Ware	RP - Possibly RPC
Context	Context 3020, XCIII-7, Phase D
Shape	Large closed, jar. Horizontal, round mouth. Flaring, thinning, rounded rim. concave neck. RimD: general 100-200, specific 110
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 2.5YR4/4. Interior slipped and lightly burnished, 2.5YR4/4
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions, no core. 2.5YR5/6. Some grey inclusions.
Wall thickness	Body 0.6 cm, base 0.7 cm.

Sample no.	RP-16203 (fabric IV) 
Ware	RP
Context	Context 3072, CXV-3, Phase G
Shape	Large closed, flat base.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 2.5YR5/6. Light wear on edge of base. Dark grey interior. Very hard fired, with pink-orange exterior slip.
Fabric	hard, medium texture. Medium number of small + medium black and white inclusions; thin, dark core. 2.5YR5/4-5/6
Wall thickness	body 1.0 cm, base 0.6 cm.

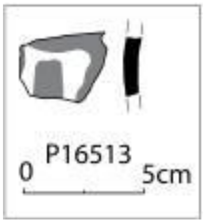
Sample no.	WPP MA-16234 (fabric IV) 
Ware	WPP
Context	Context 3046, CX-8, Phase C-1.
Shape	body, uncertain vessel type
Wall thickness	Body 8.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: ? slip. *Interior*: worn slip, ? lustre, no mottling. *Decoration*: painted. Orientation uncertain. Two wavy lines. Paint colour 2.5YR4/3. Traces of slip on interior. Possibly thin self-slip on exterior (10YR8/3-7/3).
Fabric	medium-soft, fine texture; few small black, red and white inclusions, no core. 10YR7/3

Sample no.	RPC-16395 (fabric VIII) 
Ware	RPC
Context	Context 3090, XCV-7, Phase D
Shape	Large closed, cooking pot. Foot base. Thin pointed foot from a tripod-based cooking pot.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 2.5YR3/2-2.5YR3/4. Slight discolouration at tip
Fabric	Medium-hard, medium texture. Medium number of small + medium black and white inclusions; thick, dark core. 2.5YR4/6. Some grey inclusions

Sample no.	PRS MA-16466 (burnt) 
Ware	PRS
Context	Context 3069, CXVI-8, Phase C.
Shape	vat, base, large open, flat base. Base sherd with central cylindrical pre-firing perforation, half of which is preserved. Minimum diameter of perforation approx 17; outer diameter approx 19
Wall thickness	Base 15.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 5YR6/2-5YR6/3. Interior slightly uneven with shallow finger impressions. On exterior some scratches or incisions.
Fabric	Medium-hard, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 10YR4/2-4/3 Fabric texture fine to medium. Fired medium-hard to hard

Sample no.	PRS MA-16477 (outlier) 
Ware	PRS
Context	Context 3035, CXVI-8, Phase C.
Shape	Body and base, large closed, <1/3 preserved. Flat base. BaseD 80.
Wall thickness	body 12, base 15.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 7.5YR5/4. Wear on edge of base. Base slightly concave. Matt slip on interior (2.5YR4/4). Fabric texture fine to medium. Some brown inclusions.
Fabric	medium-hard, fine texture; few small + medium black and white inclusions; thick, dark core. 7.5YR4/4

Sample no.	RP-16499 (fabric VIII) 
Ware	RP
Context	Context 3175, CX-9, Phase C
Shape	Small open, bowl. Flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, distinct mottling, even burnishing, 2.5YR5/6 Interior: medium slip, slight lustre, no mottling, 2.5YR5/4-2.5YR4/4. Light wear on edge of base
Fabric	Medium-hard, medium texture. Medium number of small black and white inclusions; thin, dark core. 7.5YR5/4-5/6
Wall thickness	Body 0.6 cm, base 0.5 cm.

Sample no.	WPP MA-16513 (outlier)  
Ware	WPP
Context	Context 3179, CXXI-7, Phase C.
Shape	body, large open
Wall thickness	Body 6.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: no slip. *Interior*: worn slip, ? lustre, no mottling, 2.5YR4/4. *Decoration*: painted. Exterior has no slip or possibly a thin self-slip. Paint matt and 2.5YR5/6. Orientation uncertain. Traces of red-brown slip across whole of interior.
Fabric	Medium-soft, fine texture. Medium number of small black and white inclusions, no core. 10YR6/3

Sample no.	PRS MA-16532 (fabric III) 
Ware	PRS
Context	Context 3159, XCIII-13, Phase A.
Shape	Vat, Body and base, large open. Flat base. BaseD 160.
Wall thickness	Body 12, base 20.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 2.5YR4/4. *Interior*: ? slip, matt lustre, no mottling, 2.5YR4/4. Base exterior rough and most of slip worn off. Base slightly flanged. Crudely made. Surface uneven.
Fabric	Medium-soft, fine texture. Medium number of small + medium black and white inclusions; thick, dark core. 7.5YR5/4. Fired medium-soft to medium-hard

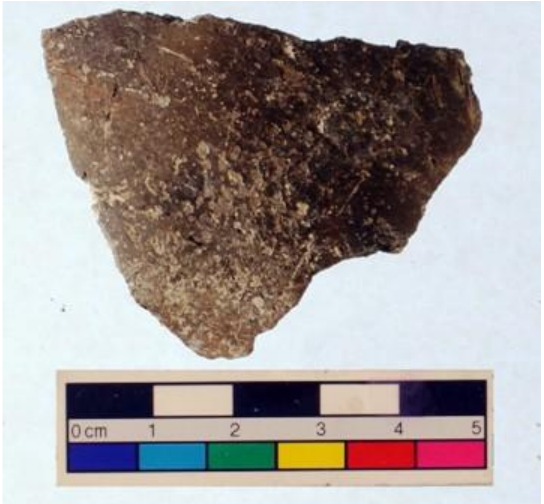
Sample no.	PRS MA-16533 (fabric III) 
Ware	PRS
Context	Context 3212, XCIII-13, Phase A.
Shape	Rim and base, uncertain vessel type, straight, thinning, rounded rim. Flat base. BaseD 200.
Wall thickness	rim 3, below rim 4, body 10, base 3.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, medium mottling, even burnishing, 2.5YR5/4-2.5YR5/6. *Interior*: medium slip, matt lustre, no mottling, 2.5YR5/4-2.5YR5/6. Crudely made. Uneven rim and interior and exterior surfaces. A few large grey inclusions. One end of fragment appears to flatten to very thin base. Fired medium-soft to medium-hard.
Fabric	medium-soft, fine texture; few small + large black and white inclusions; thick, dark core. 7.5YR5/4

Sample no.	ERS-16534 (fabric XIII) 
Ware	ERS
Context	Context 3182, LXVIII-2, Phase F
Shape	Large closed – neck
Surface treatment – Interior/Exterior	Exterior: thin slip, slight lustre, no mottling, even burnishing, 7.5YR7/4-7.5YR6/4 Thin evenly burnished self-slip. Striations across neck from burnishing or from smoothing prior to burnishing. Interior has a few spots of what may be slip.
Fabric	Medium-hard, fine texture; few small red and white inclusions, no core. 5YR6/6

Sample no.	RP-16541 (fabric IV) 
Ware	RP
Context	Context 3100, CX-9, Phase C
Shape	Small open, bowl. Flat base. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, distinct mottling, even burnishing, 2.5YR5/6 Interior: medium slip, medium lustre, no mottling, 2.5YR5/6-2.5YR5/4, Base exterior chipped.
Fabric	Hard, medium texture. Medium number of small black and white inclusions; thin, dark core. 7.5YR5/4
Wall thickness	Body 0.8 cm, base 0.5 cm.

Sample no.	RP-16543 (fabric IV) 
Ware	RP
Context	Context 3100, CX-9, Phase C
Shape	Small open bowl. RimD: general 100-200.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 7.5YR5/3. Interior: medium slip, medium lustre, no mottling, 5YR4/3
Fabric	Hard, medium texture. Medium number of small black and white inclusions, no core. 10YR5/3. Fired medium-hard to hard. Some grey inclusions.
Wall thickness	Body 0.8 cm, base 0.7 cm.

Sample no.	PRS MA-16549 (burnt) 
Ware	PRS
Context	Context 3100, Phase C - CX-9
Shape	rim+neck, uncertain vessel type, <1/3 preserved. horizontal, round mouth. Straight, thinning, flattened rim. Wide flat rim downsloping toward interior.
Wall thickness	rim 11, below rim 12, body 18.
Surface treatment / Decoration – Interior/Exterior	*Exterior*: medium slip, matt lustre, no mottling, 7.5YR5/4. Interior slipped (5 YR5/3-5/4). Some brown inclusions.

Sample no.	RP-16562 (fabric IV) 
Ware	RP
Context	Context 3091, XCV-7, Phase D
Shape	Large open, bowl. Flat base
Surface treatment – Interior/Exterior	Exterior: medium slip, medium lustre, no mottling, even burnishing, 5YR3/1. Interior: medium slip, medium lustre, no mottling, 5YR5/4-5YR2/5/1
Fabric	Hard, medium texture. Medium number of small + medium black and white inclusions, no core. Fabric fired dark through section. Some brown inclusions
Wall thickness	Body 0.8 cm, base 1.0 cm.

Sample no.	RPC-16677 (fabric VIII) 
Ware	RPC
Context	Context 3257, CXXIII-3, Phase H
Shape	Small closed, cooking pot. Base fragment with two of three legs from a tripod-based cooking pot. Legs quite short.
Surface treatment – Interior/Exterior	Exterior: medium slip, slight lustre, no mottling, even burnishing, 5YR4/4-5YR4/3 Interior slipped matt, 2.5YR4/4
Fabric	Medium-hard, medium texture. Medium number of small black and white inclusions; thin, dark core. 5YR4/4-4/6
Wall thickness	Body 0.5 cm.

IV.2.b. Notes on the macroscopic study of WPP and PRS samples.

Sample	Ware	Shape	Slip	Decoration
7471	PRS	LO	Worn, slightly lustrous slip	No decoration
7709	WPP	LC	No slip	Painted herringbone
7761	WPP	LO	No slip on exterior, slipped interior	Painted wavy lives
8551	WPP	LC	No slip	Painted thick wavy lines
9112	WPP	SO	Thin slip, matt lustre	Uncertain painted decoration
9121	PRS	LC	Worn, slightly lustrous slip	No decoration
9173	PRS	LC	Medium slip, matt lustre	No decoration
9642	PRS	LC	Medium slip, matt lustre	No decoration
9724	PRS	SO	Medium slip, matt lustre	No decoration
10234	PRS	SO	Medium slip, matt lustre	No decoration
12215	PRS	SO	Worn slip, Matt lustre	No decoration
13529	WPP	LO	No slip	Painted horizontal bands
14280	PRS	LC	Very worn slip	No decoration
14323	PRS	LC	Medium slip, matt lustre	No decoration
14338	PRS	LC	Slightly lustrous slip	No decoration
14401	WPP	SO	Worn slip	Painted horizontal and diagonal bands
14604	WPP	Uncertain shape	No slip	Painted cross-hatched motif
15242	WPP	SO	No slip	Painted horizontal bands and crosshatched motif
15277	PRS	LO	Medium slip, matt lustre	No decoration
16234	WPP	Uncertain shape	Worn slip	Painted wavy lines
16466	PRS	LO	Medium slip, matt lustre	No decoration
16477	PRS	LC	Medium slip, matt lustre	No decoration
16513	WPP	LO	Worn slip	Uncertain painted motif
16532	PRS	LO	Medium slip, matt lustre	No decoration
16533	PRS	Uncertain shape	Medium slip, matt lustre	No decoration
16549	PRS	Uncertain shape	Medium slip, matt lustre	No decoration

Appendix IV.3.
Mineralogical characterisation of the ceramic sample from Marki.

I: MICRITIC LIMESTONE RICH FABRIC WITH FEW FRAGMENTS OF CHERT AND TCFS

Samples: RPP-3570, RPP-7229, RPP-7428, WPP-7709, RPP -8789, RPP-8962, PRS-9121, RPP-9369, RPP-9496, RPP-9999, RPP-13067, RPP-13143, WPP-13529, RPP-14228, RPP-14361, RPP-14370, WPP-15242, RPP-15316, RPP-15337, RPP-16438, RPP-16444, RPP-16486, RPP-16511, RPP-16733 (24 samples)

Microstructure: Rare to absent macro planar voids, vertical to the vessel's margins (RPP-7229). Rare macro vughs, and dominant meso and micro vughs. The voids are randomly oriented and are close- to double- spaced. The non-plastic inclusions are also randomly oriented. Presence of secondary calcite, as post-depositional addition.

Groundmass: Homogeneous throughout the sections; the colour varies from very dark brown to yellow in XP (x25) and dark brown to yellowish white in PPL (x25). In some cases there is colour differentiation between the core and the vessels' margins. Other times this colour variation is between the upper margin and the rest of the section and in a few cases there is no colour differentiation and the whole of the thin section is either dark brown or yellow in XP (x25). Samples range from moderately optically active to optically inactive.

Inclusions: c:f:v $_{0.0625\ mm}$ = 60:10:30 to 40:30:30. Coarse fraction: 5.4 to 0.1mm long diameter. Fine fraction: ≤ 0.0625 mm long diameter. The matrix is fine with poorly sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from pebbles to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is close- to double spaced, and that of the fine fraction is single- to open-spaced. It is matrix-supported (Wackestone texture).

Coarse fraction

Predominant :

- Micritic limestone; sub-rounded and rounded, high to low sphericity, size 5.4-0.1mm (biggest limestone fragments found in RPP -7229 and RPP -13143)

Frequent:

- Monocrystalline quartz : angular and sub-angular, medium to low sphericity, size : 1.0-0.1 mm (largest quartz fragments: RPP -14370 and RPP -16733)

Common:

- Chert: angular and sub-angular, high to low sphericity, size: 1.8-0.1mm.
- Tcfs (clay pellets): rounded and sub-rounded, high to medium sphericity, up to 2.0 mm in long diameter (RPP-7428), sometimes containing limestone, quartz, chert, biotite.
- Calcite : sub-rounded, high to low sphericity, size : 2.2-0.1mm, in some cases altered (e.g. RPP-16486)

Few :

- Polycrystalline quartz; sub-angular, medium to low sphericity, size: 0.6-0.1 mm long diameter

Very few:

- Muscovite; angular and sub-angular, low sphericity, size 0.2-0.1 mm long diameter.
- Serpentine: angular and sub-angular, medium to low sphericity, 0.2-0.1 mm long diameter

Rare:

- Alkali feldspars; angular, low sphericity, size: 0.3-0.1 mm.
- Quartzite: sub-angular and sub-rounded, low sphericity, size: 0.6-0.1 mm
- Skeletal particles or bioclasts.

Very rare:

- Microfossils: circular voids which replaced what should be microfossils, small in size, mode: 0.1 mm in diameter.
- Quartzite-schist; angular, low sphericity, size: 0.28 mm long diameter
- Biotite; angular, low sphericity, size: 0.38-0.1 mm long diameter.
- Pyroxene: strong green in colour, angular, low sphericity, 0.1 mm long diameter
- Epidote; sub-angular, low sphericity, 0.1 mm long diameter (-16438).

Fine fraction

Dominant**:** micritic limestone

Frequent: monocrystalline quartz

Very few: chert

Rare: Biotite laths, serpentine, muscovite laths

Amorphous concentration features: Acfs are frequent in this group and vary in shape and colour. They are found both elongated and rounded in shape, dark red to light orange in colour, in XP (x25). Their size varies from 3.0 - <0.1 mm in long diameter. Voids are observed sometimes in the circumference of some acfs.

Comments: All of the corresponding pots are made of a soft fabric (hardness 1 and 2 in Moh's scale). This is a fabric rich in micritic limestone and presents metamorphic characteristics such as chert, quartzite and some rare fragments of quartzite-schist and muscovite mica-schist. Frequent presence of clay striations (e.g. RPP-7428, RPP -16438, RPP-16733)**.** Limestone fragments are rounded and sub-rounded in shape, an indication of natural weathering. Moreover some limestone fragments present indications of oxidation (e.g. RPP -8789, RPP -13143, RPP -15337, RPP-16733). Bases present evidence of drawn up clay. Dark areas around the margins of voids indicate the presence of vegetal temper. Most of the microfossils found in this fabric are open and not calcite-filled. Moreover, when found, the microfossils are distributed across the fabric and almost never within a limestone. Only in the case of RPP PLK-28 and -7229, calcite filled microfossils are found within limestone fragments.

II. IGNEOUS FABRIC WITH SOME CALCIFEROUS MATERIAL

Samples: RPP-5096, RPP-5104, RP-5862, RP-7173, RP-7320, RP-7464, RPP-9117, CW-9207, PRS-10234, RP-11359, RP-12361, RPP-12371, RP-12841, RP-12944, RPP-13085, RP-14313, WPP-14401, RP-14961, RP-14963 RPP-16408, RPP-16480, RPP-16530 (22 samples)

Microstructure: Rare meso to mega planar voids and channels, which most of the times are parallel to the vessels' margins. Common meso and micro vughs which are randomly oriented. The voids are single- to open-spaced. The non-plastic inclusions are randomly oriented.

Groundmass: Homogeneous throughout the section. The colour varies from very dark brown in both PPL and XP (x25) to yellowish white in PPL (x25) and yellow in XP (x25). There is no colour variation between the margins and the core of the vessels. The samples are moderately optically active to inactive.

Inclusions: c:f:v $_{0.0625\ mm}$ = 50:30:20 to 40:30:30
Coarse fraction: 3.2 mm to 0.1mm long diameter
Fine fraction: ≤ 0.0625 mm long diameter.
The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is double- to open-spaced and the packing of the fine fraction is close- to double-spaced. It is matrix supported (Wackestone texture).

Coarse fraction
Dominant :
- Micritic limestone; sub-rounded and rounded, high to low sphericity, 1.0-0.1 mm long diameter.

Frequent:
- Calcite; sub-rounded to rounded, high to low sphericity, size : 3.2-0.1mm long diameter. Colour varies from pink, to pinkish and yellowish white to brownish yellow.
- Basalt; sub-angular and sub-rounded, medium to low sphericity, 0.6-0.1 mm long diameter. In many cases altered basalt and devitrified matrices.
- Monocrystalline quartz ; angular and sub-angular, medium to low sphericity, 0.4-0.1mm.
- Microfossils; mode 0.2 mm in diameter, filled with calcite.
- Alkali feldspars ; angular, low sphericity, mode : 0.2mm long diameter.
- Biotite mica; angular, low sphericity, 0.6-0.1 mm long diameter.

Common:
- Polycrystalline quartz; angular, low sphericity, size: 0.4-0.1 mm long diameter.

Very few:
- Clinopyroxene; angular, low sphericity, 0.2-0.1 mm long diameter
- Plagioclase feldspars: angular, low sphericity, mode: 0.14mm long diameter
- Dolerite; sub-rounded, high sphericity, 1.6-0.6 mm long diameter

- Skeletal particles or bioclasts.

Rare:

- Orthopyroxene; sub-angular, medium to low sphericity, 0.25 mm
- Metaquartz; sub-angular, medium to low sphericity, 0.2 mm

Fine fraction
Predominant**:** micritic limestone
Frequent: monocrystalline quartz and microfossils
Few: alkali feldspars, biotite laths, serpentine and pyroxene

Amorphous concentration features: Acfs are very frequent in this fabric. Similarly to the non-plastic inclusions with the exception of micritic limestone, most acfs are small in size, mode: 0.2 mm long diameter. Most of them are actually dark brown opaques. But others vary in colour from bright orange-red to brownish orange and orange. They are shape ranges from angular (!) to rounded and from medium to low sphericity.

Comments: The samples of this fabric group are quite soft ranging from 1 to 2 in Moh's scale. The non-plastic inclusions with the exception of micritic limestone are small in size and mostly angular and have low sphericity. RPP-5104 and RPP-9117 are the two finest samples of this fabric group. The principal inclusions found in these two samples are calcite and calcite-filled microfossils.

III: Igneous Fabric with some micritic limestone fragments and microfossils, and frequent presence of ACFs

Samples: RPP-4258, PRS-9642, PRS-9724, RPP-12213, PRS-12215, RPP-14279, PRS-14323, RPP-15309, PRS-16532, PRS-16533 (10 samples)

Microstructure: Some mega planar voids, which in some samples are vertical to the section (PRS-9724, PRS-14323, RPP-14279) and in some others parallel to the sections' margins (RPP-12213, PRS-16532). Frequent meso and micro vughs, which are randomly orientated. Voids are double to open spaced and the non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the section. There is colour variability from reddish brown to olive-brown and dark-brown in XP. There is also colour variation between the margins and core of some samples or between different parts of the sections (XP, x50). The samples are moderately inactive.

Inclusions: c:f:v $_{0.0625\ mm}$ = 70:20:10 to 50:40:10
Coarse fraction: 4.0 mm to 0.1mm long diameter
Fine fraction: ≤ 0.0625 mm long diameter.
The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from pebbles to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is double- to open-spaced and the packing of the fine fraction is close- to double-spaced. It is matrix supported (Wackestone texture).

Coarse fraction
Dominant:

- Calcite; sub-rounded, medium to low sphericity, 0.3mm largest diameter
- Micritic limestone; sub-rounded and rounded, high to low sphericity, 4.0-0.1 mm long diameter.

Frequent:

- Basalt ; rounded and sub-rounded, high to low sphericity, 2.0-0.1 mm long diameter..
- Monocrystalline quartz ; angular and sub-angular, medium to low sphericity, 0.4-0.1mm.
- Microfossils; mode 0.2 mm in diameter, filled with calcite.
- Alkali feldspars; angular, low sphericity, mode : 0.2mm long diameter.
- Biotite mica; angular, low sphericity, 0.25-0.1 mm long diameter.

Common:

- Polycrystalline quartz; sub-angular, low sphericity, size: 0.4-0.1 mm long diameter
- Serpentine; sub-angular and sub-rounded, low sphericity, 0.1 mm in long diameter
- Plagioclase feldspars: angular, low sphericity, mode: 0.4mm long diameter

Few:

- Clinopyroxene; sub-angular, medium to low sphericity, 0.3-0.1 mm long diameter

Rare:

- Tcfs (clay pellets); rounded, medium sphericity, 1.00 mm in long diameter (RPP -14279)

Fine fraction
Predominant**:** calcite
Frequent: monocrystalline quartz and microfossils
Few: plagioclase feldspars, biotite laths, serpentine and clynopyroxene

Amorphous concentration features: Frequent presence of sub-angular and sub-rounded acfs. Most of them are dark brown opaques, randomy orientated across the sections of the samples. Some of them reach up to 0.5mm in long diameter but most of the acfs are 0.05mm in long diameter.

Comments: This is fabric is very similar to fabric II. Their difference is the density of igneous inclusions in fabric III and the presence of microfossils within the micritic limestone fragments of fabric II. Some rock fragments are altered. For example in some basalts the plagioclases are altered to biotite. In this fabric, microfossils are not embedded in the limestone fragments like in fabric II. The inclusions occurring in the limestone fragments include plagioclases, serpentine, biotite and in very rare cases some microfossils.

IV: BIOTITE MICA RICH FABRIC WITH VARIOUS IGNEOUS INCLUSIONS

Samples: CW-3726, RPP-5094, RP-7216, RP-7308, RP-7314, RP-7316, RPP-7427, PRS -7471, WPP-7761, PRS-9173, CW-9186, RPP-10101, CW-10224, RP-10242, RP-12473, RP-12800, RPC-12940, RPC-13016, RP-14097, RP-14225, RP-14379, RPC-15163, RPC-15305, RPC-15640, RP-15646, RPC-16175, RP-16203, RP-16541, RP-16543, RP-16562 (30 samples)

Microstructure: Rare meso to mega planar voids and channels, which are randomly orientated. Common meso and micro vughs, which are also randomly orientated. The voids are single to open-spaced and do not follow a particular pattern in their distribution across the section. The non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the section. The colour varies from reddish brown in XP to dark brown in XP. There is colour variation between the margins and the core of RPP-7427. In PRS-7471 and PRS-9173, there is colour variation between the one margin and the rest of the section. There is no colour variation in RPP-5094. The non-plastic inclusions are randomly orientated.

Inclusions: c:f:v $_{0.0625\ mm}$ = 70:20:10 to 60:15:5
Coarse fraction: 2.5 mm to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.
The matrix is moderately fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is close- to open-spaced and the packing of the fine fraction is double- to open-spaced. It is matrix supported (Wackestone texture).

Coarse fraction
Predominant:
- Biotite; angular and sub-angular, high to low sphericity, 2.5 mm in long diameter.

Frequent:
- Monocrystalline quartz; angular and sub-angular, medium to low sphericity, 0.4 mm in long diameter.

Common:
- Clinopyroxene; angular, medium sphericity, sub-angular, 0.4 mm long diameter
- Dolerite; sub-angular, high to medium sphericity, 2.0 mm long diameter
- Olivine; medium to low sphericity, sub-angular, 0.15 mm long diameter
- Polycrystalline quartz; , sub-angular, medium sphericity 0.3 mm long diameter
- Plagioclase feldspars; angular, low sphericity, 0.4 mm long diameter.

Rare:
- Microfossils; Calcite-filled.

Fine fraction
Frequent: biotite
Common: quartz
Few: plagioclase feldspars

Amorphous concentration features: Some rare sub-angular and sub-rounded, medium to low sphericity, very dark brown, almost black opaques, which are small in size. The largest ones are recorded in RPP -7427 and do not exceed 0.4 mm in long diameter.

Comments: Inconsistency in firing. Colour variation patterns differ from sample to sample in this fabric group. This is a fabric very rich in aplastic inclusions.

V: MICRITIC LIMESTONE RICH FABRIC WITH FEW CHERT FRAGMENTS

Samples: RPC-7437, RPC-10210, RPC-10212, RPC-13105, RPC-13140, RPC-15301, RPC-15303, RPC-15638 (8 samples)

Microstructure: Frequent meso vughs, with common micro vughs, and few meso to mega planar voids and channels parallel to the vessels' margins. Very few micro-voids, circular in shape, where previously microfossils. The voids are single- to double-spaced. The non-plastic inclusions are randomly oriented, even though in some cases they have a crudely developed long-axis parallel to the vessels' margins.

Groundmass: Homogeneous texture throughout the section, even though there is a distinctive colour differentiation between the core of the section and the margins. At the margins the colour is light brown in PPL (x25) and orange brown in XP (x25) and the core is dark brown in both PPL and XP (x25. All samples are optically inactive.

Inclusions: c:f:v $_{0.0625\ mm}$ = 60:10:30 to 50:20:30
Coarse fraction: 2.4 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.
The matrix is fine with poorly sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is close- to double spaced, and that of the fine fraction is single- to open-spaced. It is matrix-supported (Wackestone texture).

Coarse fraction

Predominant:

- Micritic Limestone; sub-angular and sub-rounded, high to low sphericity, with colour variations from white to yellowish brown, sometimes occurring in intergrowth with microcrystalline calcite, size: 2.4 to 0.1 mm long diameter.

Common:

- Monocrystalline quartz; angular to sub-rounded, medium to low sphericity, size: 0.4-0.1 mm.

Few:

- Calcite; sub-rounded, high to low sphericity, size: 0.8-0.1 mm long diameter,
- Chert; angular and sub-angular, medium to low sphericity size: 1.2 to 0.1 mm long diameter,
- Polycrystalline quartz; sub-angular, medium to low sphericity, size: 1.6-0.1 mm long diameter, sometimes intergrowth with laths of biotite.

Very few:

- Plagioclase feldspars; angular to sub-angular; medium to low sphericity, 0.6-0.1 mm
- Quartzite; sub-angular and sub-rounded, size: 0.6-0.1 mm long diameter,
- Microfossils: circular voids which replaced what should be microfossils, small in size, mode: 0.1 mm in diameter.
- Muscovite: angular, low sphericity, size: 0.4 mm long diameter.

Rare to absent:

- Orthopyroxene; angular, low sphericity, size:0.2 mm long diameter (RPC-13140).
- Quartzite schist: sub-angular, low sphericity, size 0.4 mm long diameter (RPC-13140).

Fine fraction
Predominant: Micritic limestone
Common: Microcrystalline calcite, Monocrystalline quartz
Rare: Olivine, Muscovite and Biotite laths, orthopyroxene

Amorphous concentration features: Orange red to dark brown and red-black, rounded and sub-rounded, very high to low sphericity, size: 2.0-0.1 mm. The larger dark brown include fine monocrystalline quartz (RPC-13140)

Comments: This is a very homogeneous group, of which the samples are mainly characterised by the presence of micritic limestone. This fabric presents some metamorphic characteristics in the form of schist and chert fragments. The presence of dark brown cores in comparison to the lighter colours of the vessels' margins suggests that the temperature in which these vessels were fired was not high enough or was not kept high for long enough for thorough oxidation. Moreover, the presence of planar voids and channels, parallel to the vessels' margins suggests the presence of organic matter, which was burnt out during firing. Fabric V exclusively consisted of cooking pots, which are large and close in shape with a round mouth. From the six samples of this group, four of them belong to the two earliest phases of the settlement. RPC-13140 belongs to phase A and RPC-7437, RPC-15301 and RPC-15303 belong to phase B. RPC-10210 and RPC-10212 belong to phase D. This fabric is the hardest of the Marki sample. The hardness of all samples was 3, with the exception of RPC-10210, the hardness of which was up to 4, using Moh's scale.

VI: MICRITIC FABRIC WITH IGNEOUS INCLUSIONS

Samples: HOB-3242, RP-7307, HOB-13262, LOOM-13585, LOOM-13829, RP-14262 (6 samples)

Microstructure: Rare meso to mega planar voids and channels, which most of the times are parallel to the vessels' margins. Common meso and micro vughs, which are randomly oriented. The voids are single- to open-spaced. The non-plastic inclusions are randomly oriented. Presence of secondary calcite.

Groundmass: Homogeneous throughout the section. The colour varies from yellowish white in PPL (x25) and yellow in XP (x25) to strong brown in both PPL and XP (x25). In most cases there is either a colour differentiation between the outer and inner surfaces of the vessel or between the margins and the core. The samples are moderately optically active to inactive

Inclusions: c:f:v $_{0.0625\ mm}$ = 70:20:10 to 50:30:20
Coarse fraction: 3.2 mm to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with poorly sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand, and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is close- to double-spaced and the packing of the fine fraction is double- to open-spaced. It is matrix supported (Wackestone texture)

Coarse fraction
Predominant:
- Micritic limestone; sub-rounded and rounded, high to low sphericity, 1.0-0.1 mm long diameter.
- Basalt; sub-angular, medium sphericity, size: 0.3-0.1mm long diameter.

Dominant:
- Calcite; sub-rounded to rounded, high to low sphericity, size : 3.2-0.1mm long diameter. Colour varies from pink, to pinkish and yellowish white to brownish yellow.

Frequent:
- Basalt; sub-angular and sub-rounded, medium to low sphericity, 0.6-0.1 mm long diameter. In many cases altered basalt and devitrified matrices.
- Monocrystalline quartz; angular and sub-angular, medium to low sphericity, 0.4-0.1mm.

• Microfossils; mode 0.2 mm in diameter, filled with calcite.
• Biotite mica; angular, low sphericity, 0.4-0.1 mm long diameter.

Common:
• Polycrystalline quartz; angular, low sphericity, size: 0.4-0.1 mm long diameter.
• Plagioclase feldspars: angular, low sphericity, mode: 0.14mm long diameter.

Few:
• Pyroxene; angular, low sphericity, 0.2-0.1 mm long diameter, especially clinopyroxene.

Very few:
• Dolerite; sub-rounded, high sphericity, 1.0-0.6 mm long diameter.

Fine fraction
Predominant: micritic limestone
Frequent: monocrystalline quartz, microfossils
Few: plagioclase feldspars, biotite laths, pyroxene, basalt

Amorphous concentration features: Acfs are dominant in this fabric and in almost all cases strong brown in colour, sub-angular, medium to low sphericity, 0.8-0.1 mm long diameter. Similarly to the non-plastic inclusions with the exception of micritic limestone, most acfs are small in size, mode: 0.2 mm long diameter. Most of them are actually dark brown opaques. But others vary in colour from bright orange-red to brownish orange and orange. Their shape ranges from sub-angular to rounded and from medium to low sphericity.

Comments: This is one of the coarsest fabrics in the whole Marki sample. Presence of large micritic limestone fragments. Larger size inclusions in loomweights.

VII: FINE FABRIC WITH MICROFOSSILS AND SOME IGNEOUS INCLUSIONS

Samples: RP-4864, ERS-6416, RP-12359 (3 samples)

Microstructure: Rare to absent planar voids and channels, rare meso and micro vughs. Most of the voids are circular in the centre of fossils. The voids are double- and open-spaced. Very limited presence of non-plastic inclusions, which are randomly oriented

Groundmass: Homogeneous throughout the section; the colour varies from olive yellow to yellow in PPL (x25) and from yellowish brown to yellow in XP (x25). There is no colour differentiation between the core and the margins.. All samples are optically inactive

Inclusions:
$c{:}f{:}v_{0.0625\,mm}$ = 10:80:10 to 0:80:20
Coarse fraction: 0.8 mm to 0.1 mm diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with very few inclusions of small size. The size of the coarse fraction ranges from coarse sand to fine sand. The fine fraction is of fine sand and the packing of both the coarse and fine fraction are double- to open-spaced and it is matrix- supported (Wackestone texture) below.

Coarse fraction
Dominant:

- Microfossils; 1.2-0.1mm long diameter.

Common:

- Monocrystalline quartz; angular, medium to low sphericity, size: 0.2-0.1 mm long diameter.
- Biotite: angular, low sphericity, 0.8-0.1 mm long diameter.

Few:

- Calcite; sub-rounded, row sphericity, 0.2-0.1 mm.

Very few:

- Plagioclase feldspars; angular, low sphericity, mode: 0.16mm long diameter.
- Basalt; angular and sub-angular, medium sphericity, size 0.6-0.2 mm long diameter.

Very rare:

- Clinopyroxene; sub-angular, low sphericity, mode: 0.2mm long diameter.
- Micritic limestone; 1.2-0.1 mm long diameter, sub-rounded, high to low sphericity.

Fine fraction
Dominant: microfossils - 6416 intergrowth with calcite and quartz)
Common: monocrystalline quart
Rare: clinopyroxene, biotite laths

Amorphous concentration features: This fabric is rich in acfs, mostly clay pellets, which are optically active and vary in colour from dark black-red to orange-red and bright orange in XP (x50), sub-angular, sub-rounded and rounded, from high to low sphericity, size: 1,2- <0.1 mm long diameter

Comments: This is a very homogeneous group, very poor in rock and mineral inclusions and quite rich in microfossils, which constitute its main components. The optical inactivity, the absence of colour differentiation, the constant yellowish brown colour of all the samples in XP and the absence of voids and blackened areas, suggest the absence of organic matter in the groundmass of these samples and that this fabric group was fired in higher and longer temperatures than other fabrics.

VIII: BIOTITE, POLYCRYSTALLINE QUARTZ AND METAQUARTZ RICH FABRIC

Samples: RPC-1089, RP-5826, RPC-6128, RPC-6453, RPC-7193, RP-7300, RPC-7493, RPC-9062, RPC-9176, RP-9200, RPC-9243, RP-9248, RP-11477, RPC-11478, RPC-12458, RPC-12823, RPC-12942, RP-12954, RP-13007, RPC-13147, RPC-14347, RPC-15183, RPC-15382, RP-15450, RP-15770, RPC-16194, RPC-16395, RP-16499, RPC-16677 (29 samples)

Microstructure: Few very thin in width meso and macro planar voids and channels orientated parallel to the vessels' margins. Common meso vughs most of them randomly orientated. The voids are single- to open-spaced. The non-plastic inclusions are randomly orientated. Presence of secondary calcite.

Groundmass: Homogeneous throughout the section. The colour varies from light red 2.5YP 6/8 and red 2.5YR 4/8 in PPL (x25) to yellowish red 5YR 5/8 and dark red 2.5YR 3/6 in XP (x25). With the exception of RPC7193 and RPC15382, the rest of the samples present colour differentiation between the core and the margins of the vessels. The core colour varies from dark greyish brown 10YR4/2 and dark yellowish brown 10YR3/4 in PPL (x25) to yellowish brown 10YR5/6 and dark brown 10YR3/3 in XP (x25). Samples range from moderately optically active (RPC7193 and RPC15382) to optically inactive.

Inclusions: c:f:v $_{0.0625\,mm}$ = 80:10:10 to 50:30:20
Coarse fraction: 7.0 mm to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with poorly sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from pebbles to fine sand, and the size of the fine fraction ranges from fine sand and below. The packing of the coarse fraction is close- to single-spaced and the packing of the fine fraction is double- to open-spaced. It is matrix supported (Wackestone texture)**.**

Coarse fraction
Predominant:
- Monocrystalline quartz ; angular, medium to low sphericity, 0.4-0.1 mm long diameter.
- Polycrystalline quartz; angular and sub-angular, high to low sphericity, 5.0-0.1 mm long diameter.

Dominant:
- Biotite; angular, high to low sphericity, 1.2-0.1 mm long diameter, in many cases altered to chlorite. Some samples are richer in biotite than other (RPC15382).

Frequent:
- Dolerite; sub-angular, high to medium sphericity, 7.0-0.4 mm long diameter (main components feldsparoids, biotite laths and acfs).

Common:
- Pyroxene; angular and sub-angular, medium to low sphericity, 0.4-0.1 mm long diameter, including both orthopyroxene and clinopyroxene.
- Basalt; sub-rounded, medium sphericity, 0.8-0.1 mm long diameter.

Few:
- Olivine; sub-angular, medium to low sphericity, 0.6-0.1 mm long diameter.
- Plagioclase feldspars; angular, low sphericity, 0.6-0.1 mm long diameter.
- Microfossils

Fine fraction
Dominant: Monocrystalline quartz, Biotite
Common: Pyroxene
Few: Olivine

Amorphous concentration features: Frequent, sub-rounded and rounded, from dark brown and translucent to reddish brown and optically active. <0.1 mm in size dark brown, translucent acfs also above and within rocks such as dolerite and basalt

Comments: Samples are rich in basalt and polycrystalline quartz. Not even distribution of biotite in all samples. Some are richer in biotite than others. RPC-7193 has clay striations which follow the margins of the handle, shaping of handle using the same fabric. A variety of periods and shapes, but mostly RPC. RPC-6128, RPC-7493, RPC-14347, RPC-15183 are fired in reduced conditions. Low grade of metamorphism, metaquartz.

IX. Fine fabric with organic matter, quartz, biotite and other igneous inclusions

Samples: RP-1082, RP-7359, RP-14958, RP-15481 (4 samples)

Microstructure: Rare mega planar voids and channels parallel to the vessels' margins. Frequent meso and micro vughs crudely oriented to the vessels' margins. The voids are double- to open spaced. In many case the voids are the centres of blackened areas, evidence for organic matter which burnt out during firing. The non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the sections. The colour varies from brown in PPL (x25) to brownish orange in XP (x25). There is colour differentiation between the core and the margins of the vessels. The cores are yellowish brown in PPL (x25) and dark yellowish brown in XP (x25). The samples are optically inactive.

Inclusions: c:f:v $_{0.0625\text{ mm}}$ = 40:40:20 to 30:40:30
Coarse fraction: 1.6 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from very coarse sand to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is double- to open-spaced and the packing of the fine fraction is single- to open- spaced. It is a matrix-supported (Wackestone texture).

Coarse Fraction
Dominant:
- Monocrystalline quartz; angular, low sphericity, 1.6-0.1 mm long diameter.

Frequent:
- Micritic limestone; sub-rounded, medium to low sphericity, 1.6-0.1 mm long diameter. Some fragments containing small fragments of monocrystalline quartz, microfossils and acfs (RP-1082).
- Biotite; angular, low sphericity, 0.2-0.1 mm long diameter.
- Calcite; angular and sub-angular, low to medium sphericity, 0.8-0.1 mm long diameter. Also some calcite filling in the centre of microfossils.
- Pyroxene; sub-angular, low sphericity, 0.16-0.1 mm long diameter.

Common:
- Plagioclase feldspars; angular, low sphericity, 0.2-0.1 mm long diameter.
- Microfossils; mode: 0.2 mm long diameter. Also some shell fragments, 0.8-0.2 mm long diameter.
- Polycrystalline quartz; sub-angular, low sphericity, 0.15-0.1 mm long diameter.

Rare:
- Epidote: sub-angular, low sphericity, 0.1mm long diameter (RP-1082).
- Dolerite; sub-angular, medium sphericity, 0.8 mm long diameter.

Fine Fraction
Dominant: Monocrystalline quartz

Frequent: Biotite
Common: Pyroxenes, Microfossils

Amorphous Concentration features: Most of them small in size, dark reddish black and translucent. Bigger ones contain monocrystalline quartz and microfossils. Some brownish orange are optically active, 1.6-<0.1 mm long diameter, mode: 0.12 mm long diameter.

Comments: Black areas around voids, organic matter burnt out during firing.

X: FINE FABRIC ENRICHED WITH BIOTITE

Samples: RP-5770, RP-6365, RP-7208, RP-7278, RP-7301, RP-11341, RP-12239, RP-12933, RP-14204 (9 samples)

Microstructure: Rare to absent meso planar voids and channels. Few meso vughs. Most voids orientated parallel to the vessels' margins. They are double to open-spaced. The non-plastic inclusions are randomly orientated. Presence of secondary calcite.

Groundmass: Homogeneous throughout the sections. Colour varies from brownish yellow in PPL (x25) to brown in XP (x25). In same cases (RP6365, RP7208, RP12933, RP14204) colour variation between the cores and the margins of the vessels. Colour varies from yellowish brown and dark brown in PPL (x25) to brown and dark brown in XP (x25). Samples are optically inactive.

Inclusions: c:f:v $_{0.0625\ mm}$ = 30:50:20 to 20:50:30
Coarse fraction: 1.0 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is moderately fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from coarse sand to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is open-spaced and the packing of the fine fraction is close to double- spaced. It is a matrix-supported (Wackestone texture).

Coarse fraction
Frequent:
- Biotite; angular, low sphericity, 0.2-0.1 mm long diameter.
- Monocrystalline quartz; angular and sub-angular, low sphericity, 0.2-0.1 mm long diameter.

Common:
- Micritic limestone; sub-angular and sub-rounded, medium to low sphericity, 0.8-0.1 mm long diameter

Very few:
- Pyroxene; angular, low sphericity, 0.2-0.1 mm long diameter.
- Polycrystalline quartz; sub-angular, low sphericity, 0.2-0.1 mm long diameter

Rare to absent:

- Dolerite; one sub-rounded fragment, medium sphericity, 0.8 mm long diameter altered in RP-11341.

Fine fraction:
Dominant: Monocrystalline quartz, Biotite
Few: Micritic limestone

Amorphous Concentration Features: Frequent, sub-rounded, high to low sphericity 1.0-<0.1 mm long diameter. Colour varies from dark brown and translucent to brownish orange and optically active. Some of the darker brown acfs contain monocrystalline quartz.

Comments: Fine fabric enriched with small fragments and laths of biotite.

XI: DOLERITE AND FELDSPAR RICH FABRIC

Samples: RP-9242, RP-14377 (2 samples)

Microstructure: Total absence of planar voids and channels. Common meso vughs. Voids randomly orientated and only sometimes crudely orientated to the vessels' margins. The voids are single to open-spaced. The non-plastic inclusions are randomly orientated.

Groundmass: Homogeneous throughout the sections. Colour is reddish brown in PPL (x25) and dark reddish brown in XP (x25). No colour variation in any of the two samples. Both samples are optically inactive.

Inclusions:
c:f:v $_{0.0625\ mm}$ = 70:10:20 to 60:20:20
Coarse fraction: 1.0 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from very coarse sand to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is close- to double spaced, and that of the fine fraction is single- to open-spaced. It is a matrix-supported (Wackestone texture).

Coarse Fraction:
Predominant:

- Monocrystalline quartz; angular, low sphericity, 0.2-0.1 mm long diameter.

Dominant:

- Dolerite; sub-rounded, high to medium sphericity, 1.0-0.5 mm long diameter

Frequent:

- Plagioclase feldspars ; angular, low sphericity, 0.2-0.1 mm long diameter.

Few :

- Basalt; sub-rounded, medium sphericity, 0.6-0.2 mm long diameter.
- Biotite, sub-angular, low sphericity, 0.2-0.1 mm long diameter

Very few:

- Pyroxene, angular, low sphericity, 0.2-0.1 mm long diameter.

Fine Fraction:
Predominant: Monocrystalline quart
Common: Biotite

Amorphous Concentration Features: Frequent, sub-rounded, 0.8-<0.1 mm long diameter, from dark brownish black and translucent to reddish brown. Bigger sized contain fragments of monocrystalline quartz. No optical activity.

Comments: Low degree of metamorphism of quartz grains. Despite the plethora of inclusions, most of them are same in size. There are also some altered feldspars.

XII: FINE FABRIC WITH ONLY A VERY SMALL NUMBER OF INCLUSIONS

Samples: RP-3265, RP-3305, RP-3609, RP-4351, RP-7256, RP-12193, RP-14053 (7 samples)

Microstructure: Few long planar voids, parallel to the vessels' margins or in the case of RP7256 vertical to the long axis of the thin section. Common mesovughs which are single- to open spaced. Very limited presence of aplastic inclusions, which are randomly oriented.

Groundmass: Homogeneous texture; the colour varies from yellow and brownish yellow in PPL (x25) to strong brown and olive yellow in XP (x25). There is no colour variation between the cores and the margins of the vessels. All samples are optically inactive.

Inclusions: c:f:v $_{0.0625\,mm}$ = 0:30:70 to 30:20:50
Coarse fraction: 2.00 mm – 0.1 mm diameter.
Fine fraction: ≤ 0.0625 mm long diameter.

The matrix is very fine with a very limited presence of inclusions, which are randomly oriented. The size of the coarse fraction ranges from granules to very fine sand. The size of the fine fraction is very fine and below. The packing of the both the coarse and the fine fractions ranges from double- to open-spaced. It is matrix-supported (Wachestone texture).

Coarse fraction
Rare:

- Calcite; sub-rounded, medium to low sphericity, size 0.6mm (RP-3305) – 0.1 mm long diameter.
- Micritic limestone; sub-rounded, medium to low sphericity, size 0.6mm (RP-3305) – 0.1 mm long diameter (RP-7256).
- Monocrystalline quartz; sub-angular and sub-rounded, low sphericity, size 0.2-0.1mm long diameter.

Rare to absent:

- Polycrystalline quartz; size 0.3-0.1 mm, sub-rounded, medium sphericity (RP-3609).

Fine fraction

Very few: biotite and muscovite laths.

Amorphous concentration features: Rare sub-rounded and rounded, high to low sphericity, size: 1.6-<0.1 mm long diameter. Colour varies from very dark black-red to light orange. Especially larger acfs contain monocrystalline quartz. Larger acfs containing quartz are only found in RP-7256.

Comments: The fabric of this group is very fine and is characterised by a very limited presence of mineral and rock inclusions. When found, these inclusions are small in size and double- to open-spaced. This absence of inclusions and the softness of the material (hardness ranges from 1 to 2 in Moh's scale) can be associated with the incised decoration that is present on all the samples of this group. All of the samples belong to RP, they are small sized and they come from phases F (RP-3609, RP-4351, RP-7256) and H (RP-3305).
RP-7256, a gourd juglet, is distinguished from the rest, as is the only one who includes larger acfs and micritic limestone fragments in its matrix.

XIII: FINE FABRIC – TOTAL ABSENCE OF DISCRIMINATING PETROLOGY

Samples: ERS-5812, ERS-11353, ERS-11482, ERS-12353, ERS-12456, ERS-15739, ERS-16534 (7 samples)

Microstructure: Rare meso planar voids and channels, common meso vughs, all voids orientated parallel to the vessels' margins and open-spaced. The very limited non-plastic inclusions randomly orientated. Presence of secondary calcite.

Groundmass: Homogeneous throughout the section. The colour varies from olive yellow in PPL (x25) to yellowish red in XP (x25). No colour variations between the cores and the margins of the vessels. All samples are optically inactive.

Inclusions: c:f:v $_{0.0625\,mm}$ = 10:50:40 to 20:40:40
Coarse fraction: 2.8 to 0.1mm long diameter.
Fine fraction: ≤ 0.0625 mm long diameter.
The matrix is moderately fine with moderately sorted inclusions and bimodal grain-size distribution. The size of the coarse fraction ranges from granules to fine sand. The fine fraction is of fine sand and below. The packing of the coarse fraction is open-spaced and the packing of the fine fraction is double- to open spaced. It is matrix-supported (Wackestone texture).

Coarse Fraction

Frequent:

- Monocrystalline quartz; angular, low sphericity, 0.2-0.1 mm long diameter.

Common:

- Micritic limestone; sub-rounded, medium to low sphericity, 2.8-0.1 mm long diameter.

Few:

- Sandstone; rounded, high to medium sphericity, 1.8-0.2 mm long diameter.
- Tcfs (clay pellets); rounded, high to medium sphericity, 1.2-0.2 mm long diameter. Some of these contain monocrystalline quartz and biotite.

Rare:

- Polycrystalline quartz; sub-angular, low sphericity, 0.2-0.1 mm long diameter.

Fine fraction
Few: Monocrystalline quartz, Biotite, Micritic limestone.

Amorphous concentration features: Acfs are the most prominent features of this group. They vary in colour, from dark reddish brown to reddish orange and they are sub-rounded and rounded from high to low sphericity.

Comments: This is the finest from all the Marki fabrics. ERS-5812 evidence for clay mixing.

REDUCED IGNEOUS FABRIC

Samples: PRS-14338, PRS-16466, PRS-16549 (3 samples)

These samples are burnt and therefore the inclusions within the corresponding sections are not easily recognisable. When inclusions are identified, they are basalts and dolerites and more rarely carbonates. All three samples look similar but without having clear views of the sections, it cannot be argued with certainty that these samples belong in the same fabric group. The two in reasons why these were put together are their burnt nature and the presence of those few visible igneous inclusions in all three samples.

OUTLIERS:

RP-1099, RP-7199, RPP-7412, WPP-8551, WPP-9112, RPP-9398, RP-12372, RP-12811, RP-13025, PRS-14280, RP-14354, WPP-14604, RP-14957, PRS-15277, RPP-15461, RP-15649, RP-16199 WPP-16234, RPP-16452, PRS-16477 WPP-16513 (21 samples)

Appendix IV.4

IV.4.a. The Marki ED-XRF dataset

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
sample	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**Total**
3242	0.81	2.61	8.42	33.31	0.2	0.24	48.02	0.34	0.02	0.08	0.23	5.36	75	96	74	91	11	27	1641	23	41	1506	BDL	10	65.5
3265	1.17	4.8	12.46	47.39	0.11	0.4	25.46	0.55	0.03	0.04	0.12	7.14	76	226	62	114	20	58	1062	25	81	1557	14	13	74.9
3305	0.54	3.43	12.31	41.17	0.16	0.33	34.73	0.46	0.01	0.03	0.14	6.03	61	221	88	113	18	60	2056	23	76	3836	BDL	21	71.8
3570	0.84	3.85	10.07	42.97	0.19	1.10	34.07	0.45	0.02	0.06	0.14	5.91	82	325	78	115	16	47	858	26	73	1737	28	13	72.7
3609	0.85	4.78	12.03	45.8	0.32	0.36	27.28	0.49	0.03	0.05	0.17	7.47	98	358	106	147	19	60	1510	23	77	1306	17	16	74.7
4258	0.80	3.96	15.06	49.87	0.24	2.21	16.10	0.55	0.03	0.03	0.28	10.52	175	108	140	257	22	40	775	31	63	1969	BDL	17	84.0
4351	1.21	4.1	11.86	46.17	0.41	0.32	27.63	0.45	0.02	0.05	0.18	7.03	80	309	81	118	19	60	2136	21	62	2754	BDL	21	75.1
4864	0.72	2.69	11.01	38.03	0.22	0.35	39.71	0.48	0.03	0.02	0.15	6.19	76	130	127	141	16	49	2043	31	84	1242	20	15	70.1
5094	1.33	7.22	16.80	57.69	0.08	0.85	4.86	0.33	0.03	0.08	0.17	10.37	157	205	116	102	18	11	584	17	35	564	16	1	91.3
5096	1.21	2.14	11.07	39.31	0.22	1.64	37.81	0.42	0.01	0.02	0.21	5.37	71	87	76	117	17	34	2075	29	86	3335	BDL	18	74.3
5104	0.56	1.94	9.49	34.80	0.25	1.04	45.83	0.39	0.01	0.02	0.18	4.73	71	94	92	119	16	33	1679	32	77	5351	BDL	16	69.3
5770	2.04	4.75	14.82	55.26	0.21	0.48	10.45	0.67	0.03	0.01	0.18	10.9	139	56	145	119	22	25	716	36	52	744	10	12	90.6
5826	1.88	3.22	16.73	56.86	0.18	0.49	7.81	0.68	0.03	0.01	0.16	11.59	151	40	154	145	24	21	1043	29	62	1948	BDL	BDL	80.1
5862	1.38	3.29	13.69	47.66	0.3	0.49	21.79	0.68	0.04	0.02	0.29	10.14	126	76	115	161	21	34	958	36	81	740	13	BDL	79.9
6365	2.46	4.73	15.49	55.4	0.22	0.5	8.66	0.69	0.04	0.01	0.19	11.42	156	56	134	161	25	23	576	40	56	593	BDL	0	88.6
6416	0.93	2.91	9.99	42.02	0.09	0.31	35.95	0.43	0.02	0.01	0.16	6.72	78	74	91	114	15	27	1607	22	45	2425	BDL	10	70.9
7193	1.13	3.16	19.35	59.43	0.13	0.49	3.05	0.68	0.03	0.01	0.14	12.02	131	76	109	127	29	28	845	40	114	2279	11	BDL	84.5
7199	1.76	4.45	16.03	56.83	0.17	0.52	7.58	0.72	0.04	0.02	0.22	11.48	147	65	130	153	26	30	461	36	64	576	11	22	90.1
7208	1.81	4.88	14.45	57.57	0.21	0.47	8.71	0.65	0.03	0.01	0.2	10.78	159	54	131	178	22	27	714	38	58	829	BDL	BDL	89.5
7216	1.31	7.64	17.31	55.81	0.03	0.23	5.22	0.32	0.03	0.10	0.19	11.69	169	250	183	100	20	BDL	193	19	26	201	BDL	BDL	90.8
7229	0.73	3.69	9.73	39.96	0.11	1.21	37.78	0.39	0.02	0.05	0.10	5.99	95	317	86	110	14	38	450	22	70	1135	45	13	72.0
7256	0.82	4.77	11.58	43.65	0.08	0.32	31.26	0.44	0.02	0.04	0.10	6.70	72	278	78	117	17	57	827	19	74	590	19	20	71.3
7278	1.83	4.4	13.52	64.19	0.15	0.44	4.45	0.61	0.03	0.01	0.27	9.97	94	61	143	165	23	29	347	35	53	315	BDL	BDL	92.5
7300	1.73	4.16	15.86	56.24	0.15	0.60	7.47	0.83	0.04	0.01	0.30	12.42	155	64	144	198	24	31	468	44	61	677	BDL	BDL	91
7301	2.51	5.17	15.32	55.55	0.14	0.50	8.33	0.69	0.04	0.01	0.21	11.31	149	55	148	173	24	27	704	37	60	691	BDL	BDL	88.6
7307	0.34	2.63	9.55	33.34	0.06	0.30	48.91	0.42	0.02	0.03	0.06	4.10	47	113	64	81	15	41	511	19	77	1412	19	17	66.2
7314	0.91	5.75	17.05	56.09	0.04	0.24	5.32	0.33	0.03	0.05	0.22	13.55	178	115	882	124	20	19	847	18	33	1926	BDL	BDL	85.2
7320	1.01	2.37	14.34	44.5	0.11	0.41	25.62	0.57	0.02	0.02	0.23	10.38	123	97	120	129	22	36	1322	35	90	2137	BDL	14	70.9
7359	1.22	4.33	15.63	58.21	0.16	0.53	7.25	0.73	0.04	0.02	0.22	11.45	164	76	119	172	26	27	583	36	70	874	10	BDL	84.3
7412	0.48	2.64	9.34	35.63	0.13	1.19	44.53	0.37	0.04	0.02	0.16	5.19	70	117	131	151	14	41	1462	29	62	640	29	14	68.6
7427	1.07	6.48	15.26	55.94	0.07	0.91	9.11	0.35	0.03	0.07	0.18	10.28	166	176	198	131	18	17	807	15	33	827	16	6	85.4
7428	0.75	3.13	11.80	43.64	0.11	1.45	31.39	0.50	0.03	0.05	0.16	6.64	102	316	109	121	18	55	1120	29	105	1655	30	18	72.6
7437	0.9	2.82	14.98	54.14	0.1	0.53	16.5	0.73	0.03	0.06	0.13	8.71	104	264	113	134	27	88	1081	46	186	1477	53	26	76.3
7471	1.15	7.44	17.39	56.39	0.03	0.65	5.08	0.33	0.03	0.08	0.18	11.11	139	235	147	94	21	9	274	19	31	485	14	BDL	90.6

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
sample	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**Total**
7493	1.34	3.5	19.15	54.68	0.11	0.56	3.94	0.78	0.04	0.02	0.55	14.73	146	66	275	701	28	21	610	36	73	3986	BDL	BDL	83.7
7709	0.90	3.16	11.64	42.29	0.07	1.24	33.67	0.47	0.02	0.05	0.11	6.15	95	230	63	93	17	51	563	27	103	942	28	20	76.3
7761	1.76	6.24	15.13	55.12	0.05	0.96	9.62	0.34	0.03	0.08	0.18	10.31	159	193	139	117	18	18	573	15	36	541	17	3	90.6
8551	0.90	2.63	12.61	42.92	0.18	1.78	31.29	0.52	0.01	0.01	0.18	6.55	87	91	95	126	18	38	1448	35	96	1915	26	17	78.0
8789	0.72	2.91	10.37	38.66	0.06	1.34	39.27	0.44	0.02	0.04	0.09	5.86	93	213	72	98	18	51	622	24	92	826	23	16	68.3
9112	0.51	2.51	8.49	32.33	0.12	1.35	49.89	0.30	0.02	0.02	0.11	4.11	68	88	103	96	14	34	1496	22	57	547	31	14	69.4
9117	1.10	3.63	11.72	41.01	0.10	1.27	33.95	0.31	0.01	0.02	0.19	6.44	95	96	191	154	15	30	1285	18	56	419	24	16	76.6
9121	0.79	3.64	10.77	40.29	0.12	1.35	36.08	0.41	0.02	0.04	0.10	6.20	105	294	81	100	17	51	534	23	78	546	27	18	75.2
9173	1.26	6.10	15.27	55.34	0.06	1.12	9.32	0.33	0.03	0.07	0.18	10.74	166	171	196	137	21	15	580	16	31	397	17	2	82.3
9176	1.18	4.76	18.84	57.91	0.05	0.41	2.20	0.57	0.04	0.01	0.21	13.61	180	46	228	196	28	19	598	27	49	617	BDL	BDL	85.3
9200	1.44	4.29	19.36	55.68	0.19	0.31	4.01	0.43	0.05	0.03	0.17	13.68	178	91	458	144	24	10	908	21	26	1610	BDL	BDL	81.5
9242	3.95	4.19	17.66	56.83	0.05	0.69	1.33	0.95	0.04	0.01	0.24	13.97	183	BDL	128	175	33	BDL	134	51	68	74	BDL	77	87.8
9248	2.14	3.64	18.00	55.36	0.06	0.56	5.39	0.78	0.04	0.01	0.2	13.68	153	46	149	146	27	11	444	34	53	358	12	13	89.3
9369	0.75	3.69	9.35	38.95	0.08	1.10	39.70	0.41	0.02	0.05	0.12	5.52	81	275	77	96	16	41	980	22	76	1023	21	13	68.4
9398	1.44	4.46	14.65	54.79	0.15	1.37	12.04	0.66	0.04	0.02	0.17	9.99	146	61	137	145	21	24	803	32	59	811	17	14	88.5
9496	1.01	4.35	10.83	43.48	0.06	1.15	31.82	0.44	0.02	0.07	0.12	6.44	85	305	76	100	17	43	588	26	86	677	21	19	75.7
9642	0.69	3.09	13.14	46.15	0.22	1.49	25.73	0.58	0.02	0.02	0.21	8.19	131	106	103	145	22	37	1280	36	99	2615	BDL	12	74.7
9724	1.21	3.18	14.15	46.63	0.14	1.56	22.56	0.70	0.04	0.02	0.26	9.28	148	69	97	137	20	37	843	40	89	1276	21	15	83.6
9999	0.64	3.86	10.66	40.21	0.13	1.56	34.30	0.43	0.02	0.06	0.14	7.79	106	391	60	99	19	52	679	25	76	550	25	14	72.3
10101	1.36	6.27	14.21	52.54	0.15	1.10	14.40	0.32	0.03	0.06	0.17	9.18	139	156	163	157	20	18	957	15	31	466	17	8	83.9
10210	0.75	2.73	15.31	54.54	0.1	0.53	16.11	0.74	0.03	0.04	0.14	8.65	96	241	104	152	28	85	1269	45	190	1008	51	27	75.7
10212	0.79	2.70	15.92	54.80	0.15	0.55	14.82	0.76	0.03	0.04	0.12	9.00	129	239	87	158	28	83	1185	46	188	984	55	26	75.7
10234	0.94	3.07	13.21	44.67	0.17	1.88	28.02	0.57	0.03	0.01	0.20	6.94	93	120	118	148	20	37	1161	36	92	1019	21	18	79.5
10242	1.10	7.26	16.71	55.34	0.07	0.84	6.93	0.33	0.03	0.08	0.19	10.99	166	211	158	116	18	15	331	20	28	214	18	12	89.8
11353	1.60	5.07	14.84	51.72	0.17	1.48	14.04	0.61	0.03	0.02	0.22	9.99	129	147	98	121	22	49	731	35	67	733	11	BDL	91.1
11359	1.36	3.73	14.64	49.83	0.10	1.47	17.28	0.70	0.04	0.02	0.18	10.30	129	89	144	148	21	29	933	33	65	1845	14	13	78.6
11477	1.99	4.70	18.63	56.83	0.05	0.75	3.17	0.43	0.04	0.04	0.17	13.09	213	92	280	126	25	14	151	25	38	129	16	BDL	91.8
11482	0.80	5.08	17.39	54.65	0.23	0.51	12.32	0.70	0.03	0.02	0.15	7.83	75	122	98	152	30	131	710	37	145	1235	50	22	86.8
12193	0.66	4.33	13.17	48.27	0.18	0.37	25.09	0.51	0.01	0.04	0.16	6.82	79	243	82	145	22	74	780	26	111	2284	24	21	73.1
12213	1.32	3.26	12.72	45.90	0.23	1.57	24.74	0.63	0.04	0.02	0.23	9.05	125	79	118	155	20	29	1165	33	77	1102	23	10	76.3
12215	1.15	3.22	13.37	47.74	0.16	1.41	22.17	0.68	0.03	0.01	0.21	9.58	135	66	129	161	22	26	1022	36	82	959	0	10	77.4
12353	0.81	4.00	18.91	57.78	0.17	0.55	7.80	0.76	0.03	0.03	0.14	8.77	111	157	109	178	35	156	443	41	170	877	56	27	87.5
12359	1.01	5.02	10.78	43.69	0.09	0.32	31.97	0.45	0.02	0.04	0.11	6.24	66	221	74	109	16	46	1368	22	71	575	11	13	71.4
12371	0.91	2.84	13.95	45.37	0.12	1.45	24.57	0.59	0.03	0.02	0.17	9.75	96	86	125	127	22	33	955	33	82	811	17	11	74.4
12372	0.65	6.60	11.56	49.01	0.27	0.35	21.73	0.48	0.03	0.07	0.16	8.78	106	623	97	129	20	60	977	23	77	885	26	12	74.8
12456	0.58	4.63	17.56	56.51	0.18	0.51	9.99	0.71	0.03	0.03	0.17	8.83	118	193	116	175	32	139	560	37	155	1000	52	28	84.4
12458	1.87	5.13	18.64	56.11	0.22	0.29	4.01	0.40	0.04	0.03	0.18	12.94	165	89	215	191	25	14	250	25	36	384	11	BDL	89.7
12473	1.10	7.30	18.03	56.42	0.03	0.24	4.78	0.33	0.03	0.09	0.18	11.35	141	225	191	97	19	13	186	20	36	219	10	BDL	93

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
sample	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**Total**
12811	1.27	5.11	14.83	52.28	0.16	0.47	15.67	0.65	0.03	0.04	0.17	8.94	108	284	91	158	23	63	1112	29	100	1630	17	16	78.4
12823	1.10	2.71	19.28	58.98	0.06	0.50	3.23	0.69	0.03	0.01	0.15	12.71	151	38	149	108	30	15	606	35	77	4258	BDL	BDL	82.9
12940	0.98	5.61	17.71	55.55	0.12	0.27	4.90	0.37	0.04	0.05	0.21	13.87	178	115	758	118	22	12	586	20	33	1297	BDL	BDL	82
12942	2.03	4.47	18.65	56.85	0.05	0.31	3.67	0.43	0.04	0.03	0.18	13.04	150	107	218	210	28	13	538	23	39	1039	BDL	BDL	83.7
13016	2.28	5.99	17.03	58.03	0.09	0.26	3.40	0.37	0.04	0.07	0.20	12.12	178	157	231	139	23	15	166	21	37	147	BDL	BDL	89.7
13025	0.97	5.34	12.11	45.82	0.12	0.33	27.56	0.46	0.02	0.04	0.13	6.68	81	212	62	104	18	56	1406	20	82	2026	17	31	74.5
13067	0.35	4.29	9.90	41.30	0.10	1.35	36.04	0.40	0.02	0.04	0.13	5.88	88	284	91	108	17	45	562	29	81	603	30	15	70.4
13105	0.90	2.80	15.35	56.23	0.13	0.54	13.87	0.75	0.03	0.05	0.10	8.93	89	254	180	170	30	86	902	47	197	1209	57	31	75.4
13140	0.22	2.82	16.22	57.73	0.18	0.54	12.22	0.75	0.03	0.05	0.10	8.80	111	247	167	167	29	85	904	46	198	1226	48	26	77.5
13143	0.97	3.08	11.27	41.63	0.12	1.73	34.02	0.48	0.02	0.05	0.11	6.22	89	255	188	108	18	51	717	26	95	1247	23	41	73.0
13147	1.25	6.53	16.00	54.73	0.05	0.24	8.51	0.34	0.04	0.08	0.21	11.82	150	198	180	145	23	13	538	18	28	624	BDL	BDL	79.3
13262	0.4	1.72	7.34	27.74	0.21	0.21	57.92	0.29	BDL	0.01	0.18	3.45	65	66	54	93	15	34	1965	27	65	2894	0	20	64.8
13529	0.95	4.36	9.85	41.80	0.15	1.38	34.47	0.41	0.02	0.07	0.18	6.06	109	338	112	115	15	39	893	24	71	1095	27	16	73.1
13585	0.16	1.99	6.88	24.84	0.14	0.23	61.38	0.31	0.02	0.01	0.17	3.53	36	56	81	77	13	27	1404	25	50	1612	BDL	19	62.4
13829	0.24	1.89	7.97	28.77	0.22	0.23	55.82	0.32	0.01	0.01	0.18	3.83	38	75	76	97	13	33	1648	29	76	2910	18	26	65.6
14053	0.73	3.70	13.55	46.56	0.16	0.37	26.53	0.51	0.02	0.03	0.13	7.41	89	272	97	139	23	73	1625	23	95	599	37	26	73.2
14279	0.64	3.38	10.33	43.58	0.15	1.63	32.61	0.41	0.02	0.03	0.19	6.70	93	132	170	133	16	27	1377	27	48	1204	19	12	72.1
14280	0.59	4.29	14.51	55.07	0.17	2.13	11.65	0.53	0.04	0.06	0.11	10.49	131	291	275	232	26	54	1194	41	99	1306	28	17	79.6
14323	0.95	3.02	12.85	44.95	0.10	1.59	25.38	0.68	0.03	0.01	0.23	9.96	118	68	131	162	21	22	975	35	78	862	22	8	71.6
14338	1.56	4.77	16.61	55.58	0.07	1.30	7.15	0.58	0.04	0.01	0.16	12.06	166	34	257	137	25	14	270	29	47	223	BDL	1	88.0
14361	0.79	3.01	12.33	46.94	0.17	1.78	27.71	0.60	0.02	0.05	0.11	6.19	74	195	72	104	18	55	774	31	127	1431	31	16	74.9
14370	0.84	3.51	12.63	48.11	0.23	2.05	24.89	0.55	0.02	0.04	0.13	6.70	85	176	86	122	20	62	1168	26	109	1092	34	21	75.7
14604	0.51	2.77	10.68	39.42	0.20	1.69	37.55	0.39	0.07	0.03	0.07	6.37	79	169	208	184	18	46	1194	41	62	432	26	16	73.2
14957	0.69	3.43	11.54	41.75	0.19	0.35	34.45	0.48	0.03	0.03	0.11	6.51	84	190	83	165	17	60	1829	24	88	1778	22	20	72.2
14961	1.67	3.79	15.02	52.6	0.12	0.53	15.31	0.73	0.04	0.02	0.15	9.74	99	94	107	174	24	44	1211	30	76	867	13	BDL	79
15183	1.00	4.25	18.69	56.88	0.05	0.49	3.00	0.68	0.04	0.01	0.26	14.27	175	44	261	431	28	14	623	30	51	2127	BDL	58	80.5
15277	0.97	2.31	12.09	41.41	0.15	1.39	33.30	0.47	0.03	0.02	0.19	7.28	110	135	160	122	20	42	1357	28	79	1769	27	14	73.7
15301	0.95	2.49	14.79	51.45	0.12	0.53	19.63	0.74	0.03	0.05	0.15	8.71	116	249	106	145	26	84	1160	46	183	1354	48	27	74.4
15303	0.76	2.8	14.38	53.04	0.14	0.51	18.84	0.70	0.03	0.05	0.12	8.29	100	253	147	148	25	82	1051	43	174	1247	56	33	72.7
15305	1.03	6.20	18.1	57.35	0.1	0.25	5.02	0.35	0.03	0.07	0.18	11.1	168	213	225	97	18	11	510	19	40	873	BDL	BDL	82.5
15309	0.74	3.16	12.46	43.57	0.18	1.41	29.28	0.60	0.03	0.02	0.20	8.04	117	85	125	150	19	34	1049	35	79	1295	20	16	73.8
15316	0.86	3.31	10.81	41.72	0.16	1.37	35.94	0.48	0.02	0.04	0.10	4.84	66	198	111	85	15	42	913	23	96	1727	22	25	75.6
15337	1.06	3.55	11.06	41.69	0.08	1.28	34.54	0.43	0.02	0.05	0.09	5.99	79	250	84	87	16	44	484	25	85	538	24	19	75.7
15461	0.64	2.63	11.69	42.16	0.15	1.96	33.34	0.42	0.07	0.03	0.09	6.48	107	158	167	139	17	41	1230	38	57	1246	18	27	77.2
15481	1.24	5.26	14.08	54.40	0.10	0.51	12.21	0.70	0.04	0.01	0.17	11.05	144	71	160	150	25	25	560	35	67	952	BDL	BDL	77.4
15638	0.57	3.02	14.55	52.28	0.13	0.49	19.74	0.67	0.03	0.05	0.12	8.07	92	246	121	147	25	78	897	43	157	997	53	24	73.4
15646	0.97	7.14	17.95	56.14	0.03	0.24	5.38	0.34	0.03	0.09	0.18	11.4	156	237	215	98	18	13	156	20	35	117	BDL	BDL	92.4
15739	0.57	4.45	17.59	54.81	0.15	0.52	12.33	0.71	0.03	0.02	0.18	8.36	103	132	95	156	30	142	602	38	161	1187	49	27	83.3

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO	Anlt
sample	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**Total**
16175	1.85	5.43	16.64	59.07	0.2	0.31	3.54	0.43	0.04	0.08	0.14	12.05	154	148	329	129	20	17	554	18	39	862	BDL	BDL	81.8
16194	1.88	3.08	18.20	58.22	0.08	0.62	3.31	0.86	0.05	0.01	0.24	13.27	173	41	155	151	28	18	511	35	79	561	13	BDL	83
16234	0.39	1.74	10.17	35.64	0.11	1.47	43.45	0.43	0.04	0.02	0.21	5.91	82	131	122	117	15	39	1535	27	65	1880	BDL	17	68.8
16395	1.87	3.1	18.34	58.52	0.03	0.57	2.77	0.78	0.04	0.01	0.20	13.47	181	39	168	143	29	14	562	34	68	1670	BDL	BDL	87.2
16408	0.55	2.48	8.86	39.43	0.14	1.66	40.84	0.35	0.02	0.02	0.20	5.10	80	86	123	108	13	27	1645	22	40	1272	BDL	15	70.9
16438	0.85	4.76	10.65	42.05	0.08	1.51	33.18	0.42	0.01	0.05	0.11	6.15	98	326	88	101	16	50	420	22	77	578	26	17	76.2
16444	0.70	3.84	12.52	44.43	0.13	1.80	27.06	0.52	0.03	0.06	0.12	8.55	114	382	63	118	20	64	659	29	101	965	31	18	76.6
16452	1.55	4.61	13.45	52.54	0.09	1.70	15.73	0.61	0.03	0.02	0.11	9.37	97	99	83	151	20	30	638	28	57	676	27	9	79.7
16466	0.78	3.09	14.11	45.14	0.09	1.57	21.07	0.95	0.05	0.01	0.23	12.67	162	38	104	130	23	15	697	39	70	1058	18	4	76.5
16477	1.08	2.90	15.10	48.67	0.22	2.01	18.13	0.70	0.04	0.02	0.18	10.65	168	70	123	126	23	29	765	32	67	1464	19	8	79.4
16480	1.01	2.57	14.33	46.56	0.10	1.63	23.48	0.56	0.02	0.01	0.16	9.17	131	72	97	114	21	26	930	30	69	2377	18	12	78.9
16486	0.92	4.14	11.13	45.62	0.08	1.63	28.36	0.47	0.02	0.07	0.11	7.19	106	392	128	103	17	47	595	26	85	1014	33	14	75.8
16511	0.53	3.24	10.14	39.32	0.08	1.50	38.36	0.42	0.02	0.05	0.11	6.03	88	296	94	95	15	47	602	24	90	629	31	14	69.4
16513	1.72	4.67	14.39	51.55	0.09	1.11	16.10	0.37	0.03	0.06	0.19	9.51	120	151	160	123	20	24	847	19	43	491	23	9	85.2
16530	0.85	2.56	12.33	42.04	0.12	1.99	30.92	0.62	0.03	0.02	0.22	7.88	116	100	112	131	21	37	1347	35	93	2181	BDL	15	71.4
16532	0.82	3.53	13.74	47.51	0.11	1.88	21.64	0.66	0.03	0.02	0.26	9.56	129	92	148	152	21	31	816	38	86	753	21	11	79.1
16533	1.02	3.36	13.06	45.69	0.12	2.04	24.04	0.62	0.03	0.02	0.25	9.49	113	100	124	135	21	28	1012	32	70	900	21	8	74.9
16534	0.83	3.96	17.86	56.27	0.17	0.53	10.95	0.73	0.03	0.03	0.15	8.25	119	126	97	160	31	147	562	41	173	938	65	21	86.4
16541	1.16	7.01	18.6	55.83	0.02	0.23	4.92	0.32	0.03	0.08	0.18	11.49	160	230	207	91	23	11	150	20	27	391	BDL	BDL	91.3
16543	1.51	7.94	15.69	55.77	0.06	0.23	7.56	0.31	0.03	0.09	0.18	10.53	139	216	140	95	19	BDL	233	18	24	237	BDL	16	93.6
16549	1.61	5.86	17.72	58.41	0.07	0.38	1.56	0.57	0.04	0.02	0.35	13.21	157	43	347	966	23	5	125	29	34	207	16	2	90.7
16562	1.12	7.03	18.03	56.45	0.14	0.24	4.87	0.33	0.03	0.08	0.19	11.34	164	210	113	165	21	11	345	19	29	415	BDL	BDL	86.6

IV.4.b. The chemical variation within the RPP fabric groups as defined by ED-XRF.

Evaluation of the chemical variation within each fabric group calculating the standard deviation (s) and the coefficient of variation (CV in %) for each oxide after ED-XRF repeated analytical runs of each sample. The arithmetic mean (μ) represents the analysed values of the different samples (n=number of samples). Maximum and minimum analysed values for each fabric group are also given.

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Fabric I																								
μ (n=21)	0.78	3.70	10.81	42.15	0.11	1.44	33.78	0.45	0.02	0.05	0.12	6.32	92	294	94	105	17	48	707	26	88	979	28	18
max	1.06	4.76	12.63	48.11	0.23	2.05	39.70	0.60	0.03	0.07	0.18	8.55	114	415	188	126	20	64	1168	31	127	1737	45	41
min	0.35	2.91	9.35	38.66	0.06	1.10	24.89	0.39	0.01	0.04	0.09	4.84	66	176	60	85	14	38	420	22	66	538	21	13
σ	0.17	0.53	0.96	2.54	0.04	0.25	4.05	0.05	0.00	0.01	0.02	0.78	12	68	31	12	2	7	210	3	15	400	6	6
CV	22	14	9	6	39	17	12	12	21	18	19	12	13	23	33	11	10	14	30	10	17	41	20	35
Fabric II																								
μ (n=12)	1.05	2.87	12.72	43.98	0.15	1.29	28.78	0.54	0.03	0.02	0.20	7.99	102	91	118	136	19	33	1292	31	75	1863	10	12
max	1.67	3.79	15.02	52.60	0.30	1.99	45.83	0.73	0.04	0.02	0.29	10.38	131	120	191	174	24	44	2075	36	93	5351	24	18
min	0.55	1.94	8.86	34.80	0.10	0.41	15.31	0.31	0.01	0.01	0.15	4.73	71	72	76	108	13	26	930	18	40	419	BDL	BDL
σ	0.33	0.63	2.05	4.96	0.07	0.55	9.38	0.14	0.01	0.00	0.04	2.19	22	12	29	21	3	5	357	5	16	1391	9	6
CV	31	22	16	11	43	43	33	26	48	15	19	27	22	13	24	15	18	15	28	18	21	75	94	49
Fabric III																								
μ (n=10)	0.93	3.32	13.09	46.16	0.17	1.68	24.43	0.61	0.03	0.02	0.23	9.04	128	91	129	159	20	31	1031	34	77	1293	15	12
max	1.32	3.96	15.06	49.87	0.24	2.21	32.61	0.70	0.04	0.03	0.28	10.52	175	132	170	257	22	40	1377	40	99	2615	23	17
min	0.64	3.02	10.33	43.57	0.10	1.41	16.10	0.41	0.02	0.01	0.19	6.70	93	66	97	133	16	22	775	27	48	753	BDL	8
σ	0.23	0.27	1.23	1.93	0.05	0.27	4.46	0.08	0.01	0.01	0.03	1.11	22	21	21	36	2	6	197	3	14	577	10	3
CV	25	8	9	4	31	16	18	14	23	29	13	12	17	24	17	23	9	18	19	10	19	45	69	27
Fabric IV																								
μ (n=17)	1.23	6.71	16.82	56.05	0.07	0.52	6.52	0.34	0.03	0.08	0.18	11.26	159	194	256	116	20	12	463	18	32	590	7	3
max	1.85	7.94	18.60	59.07	0.20	1.12	14.40	0.43	0.04	0.10	0.22	13.87	178	250	882	165	23	19	957	20	40	1926	18	16
min	0.91	5.43	14.21	52.54	0.02	0.23	3.54	0.31	0.03	0.05	0.14	9.18	139	115	113	91	18	BDL	150	15	24	117	BDL	BDL
σ	0.27	0.75	1.28	1.34	0.05	0.35	2.73	0.03	0.00	0.01	0.02	1.14	13	41	219	22	2	5	255	2	4	462	8	5
CV	22	11	8	2	67	68	42	8	11	18	9	10	8	21	85	19	8	44	55	10	14	78	112	173
Fabric V																								
μ (n=8)	0.73	2.77	15.19	54.28	0.13	0.53	16.47	0.73	0.03	0.05	0.12	8.65	105	249	128	153	27	84	1056	45	184	1188	53	28
max	0.95	3.02	16.22	57.73	0.18	0.55	19.74	0.76	0.03	0.06	0.15	9.00	129	264	180	170	30	88	1269	47	198	1477	57	33
min	0.22	2.49	14.38	51.45	0.10	0.49	12.22	0.67	0.03	0.04	0.10	8.07	89	239	87	134	25	78	897	43	157	984	48	24

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
σ	0.24	0.15	0.64	2.06	0.03	0.02	2.78	0.03	0.00	0.01	0.02	0.32	13	8	33	12	2	3	144	1	13	180	3	3
CV	33	5	4	4	20	4	17	4	0	13	14	4	13	3	26	8	7	4	14	3	7	15	6	11
Fabric VI																								
μ (n=5)	0.39	2.17	8.03	29.60	0.17	0.24	54.41	0.34	0.01	0.03	0.16	4.05	52	81	70	88	13	32	1434	25	62	2067	7	18
max	0.81	2.63	9.55	33.34	0.22	0.30	61.38	0.42	0.02	0.08	0.23	5.36	75	113	81	97	15	41	1965	29	77	2910	19	26
min	0.16	1.72	6.88	24.84	0.06	0.21	48.02	0.29	0.00	0.01	0.06	3.45	36	56	54	77	11	27	511	19	41	1412	BDL	10
σ	0.25	0.42	1.03	3.69	0.07	0.03	5.79	0.05	0.01	0.03	0.06	0.77	17	23	11	8	2	6	553	4	16	766	10	6
CV	65	20	13	12	40	14	11	15	64	108	38	19	33	28	15	10	12	18	39	16	26	37	137	31
Fabric VII																								
μ (n=3)	0.89	3.54	10.59	41.25	0.13	0.33	35.88	0.45	0.02	0.02	0.14	6.38	73	142	97	121	16	41	1673	25	67	1414	10	13
max	1.01	5.02	11.01	43.69	0.22	0.35	39.71	0.48	0.03	0.04	0.16	6.72	78	221	127	141	16	49	2043	31	84	2425	20	15
min	0.72	2.69	9.99	38.03	0.09	0.31	31.97	0.43	0.02	0.01	0.11	6.19	66	74	74	109	15	27	1368	22	45	575	BDL	10
σ	0.15	1.29	0.54	2.91	0.08	0.02	3.87	0.03	0.01	0.02	0.03	0.29	6	74	27	17	1	12	342	5	20	937	10	3
CV	17	36	5	7	56	6	11	6	25	65	19	5	9	52	28	14	4	29	20	21	30	66	97	20
Fabric VIII																								
μ (n=16)	1.63	4.17	18.17	56.96	0.10	0.47	4.31	0.61	0.04	0.02	0.22	13.03	164	77	211	206	26	17	554	30	56	1401	4	4
max	2.28	6.53	19.36	59.43	0.22	0.75	8.51	0.86	0.05	0.08	0.55	14.73	213	198	458	701	30	31	1043	44	114	4258	16	58
min	1.00	2.71	15.86	54.68	0.03	0.24	2.20	0.34	0.03	0.01	0.14	11.59	131	38	109	108	23	10	151	18	26	129	BDL	BDL
σ	0.42	1.09	1.15	1.46	0.06	0.15	1.94	0.18	0.01	0.02	0.10	0.88	20	46	84	152	2	6	243	7	23	1277	6	15
CV	26	26	6	3	62	32	45	30	15	91	44	7	12	59	40	73	9	35	44	25	41	91	156	330
Fabric IX																								
μ (n=2)	1.23	4.80	14.86	56.31	0.13	0.52	9.73	0.72	0.04	0.02	0.20	11.25	154	74	140	161	26	26	572	36	69	913	5	BDL
max	1.24	5.26	15.63	58.21	0.16	0.53	12.21	0.73	0.04	0.02	0.22	11.45	164	76	160	172	26	27	583	36	70	952	10	BDL
min	1.22	4.33	14.08	54.40	0.10	0.51	7.25	0.70	0.04	0.01	0.17	11.05	144	71	119	150	25	25	560	35	67	874	BDL	BDL
σ	0.01	0.66	1.10	2.69	0.04	0.01	3.51	0.02	0.00	0.01	0.04	0.28	14	4	29	16	1	1	16	1	2	55	7	0
CV	1	14	7	5	33	3	36	3	0	47	18	3	9	5	21	10	3	5	3	2	3	6	141	
Fabric X																								
μ (n=5)	2.13	4.79	14.72	57.59	0.19	0.48	8.12	0.66	0.03	0.01	0.21	10.88	139	56	140	159	23	26	611	37	56	634	2	2
max	2.51	5.17	15.49	64.19	0.22	0.50	10.45	0.69	0.04	0.01	0.27	11.42	159	61	148	178	25	29	716	40	60	829	10	12
min	1.81	4.40	13.52	55.26	0.14	0.44	4.45	0.61	0.03	0.01	0.18	9.97	94	54	131	119	22	23	347	35	52	315	BDL	BDL
σ	0.34	0.28	0.79	3.81	0.04	0.02	2.21	0.03	0.01	0.00	0.04	0.57	27	3	7	23	1	2	159	2	3	198	4	5
CV	16	6	5	7	20	5	27	5	16	0	17	5	19	5	5	15	6	9	26	5	6	31	224	224
Fabric XII																								
μ (n=7)	0.85	4.27	12.42	45.57	0.20	0.35	28.28	0.49	0.02	0.04	0.14	6.94	79	272	85	128	20	63	1428	23	82	1847	16	20
max	1.21	4.80	13.55	48.27	0.41	0.40	34.73	0.55	0.03	0.05	0.18	7.47	98	358	106	147	23	74	2136	26	111	3836	37	26
min	0.54	3.43	11.58	41.17	0.08	0.32	25.09	0.44	0.01	0.03	0.10	6.03	61	221	62	113	17	57	780	19	62	590	BDL	13

	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	V_2O_5	Cr_2O_3	MnO	Fe_2O_3	CoO	NiO	CuO	ZnO	Ga_2O_3	Rb_2O	SrO	Y_2O_3	ZrO_2	BaO	CeO_2	PbO
	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
σ	0.25	0.56	0.71	2.42	0.12	0.03	3.49	0.04	0.01	0.01	0.03	0.49	12	49	14	15	2	7	556	2	16	1189	13	4
CV	29	13	6	5	59	9	12	8	41	20	20	7	15	18	17	12	11	11	39	10	19	64	83	21
Fabric XIII																								
μ (n=6)	0.87	4.53	17.36	55.29	0.18	0.68	11.24	0.70	0.03	0.03	0.17	8.67	109	146	102	157	30	127	601	38	145	995	47	21
max	1.60	5.08	18.91	57.78	0.23	1.48	14.04	0.76	0.03	0.03	0.22	9.99	129	193	116	178	35	156	731	41	173	1235	65	28
min	0.57	3.96	14.84	51.72	0.15	0.51	7.80	0.61	0.03	0.02	0.14	7.83	75	122	95	121	22	49	443	35	67	733	11	BDL
σ	0.38	0.49	1.35	2.10	0.03	0.39	2.18	0.05	0.00	0.01	0.03	0.74	19	26	8	20	4	39	107	2	40	190	19	11
CV	44	11	8	4	15	57	19	7	0	22	17	9	17	18	8	13	14	31	18	6	27	19	40	51

Appendix IV.5.
The chemical characterisation of Philia, EC and MC ceramic slips using SEM-EDS.

The size of analysed areas varied according to the thickness and degree of preservation of each individual ceramic slip layer. The arithmetic mean represents the analysed values of the different measurements on each sample. Maximum and minimum analysed values and standard deviation (s) values for repetitive runs on the same sample are also given.

Values are given in compound oxides %.

RP-3305	Na_2O	MgO	Al_2O_3	SiO_2	K_2O	CaO	TiO_2	FeO
mean	BDL	3.1	21.6	58.6	5.1	2	1.5	8.3
s		0.2	1.8	2.1	0.7	0.5	0.4	2.5
max	BDL	3.3	23.7	60.2	5.9	2.4	2.0	10.6
min	BDL	2.9	20.4	56.3	4.6	1.5	1.2	5.7
RP-3609	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.7	2.6	16.9	59.2	4.3	6.3	1.1	14.7
s	0.3	0.3	2.9	7.5	1.0	8.2	1.1	26.8
max	1.1	3.1	21.3	71.3	5.4	30.9	4.4	99.7
min	BDL	2.2	10.9	41.2	2.4	0.4	BDL	5.4
RP-4351	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.4	3.3	19	56.4	6.6	2.7	1.1	10.2
s	0.2	3.2	2.5	2.6	1.0	0.7	0.2	2.1
max	0.7	10.4	20.4	59.1	7.4	4.0	1.5	13
min	BDL	1.7	13.5	51.4	4.5	1.9	0.9	8.1
RP-4864	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.3	1.9	18.3	54.2	1.7	5.2	0.9	17.5
s	0.2	0.3	0.6	1.2	0.2	1.9	0.1	0.8
max	0.5	2.3	19	55.9	2.2	8.8	1.1	18.8
min	BDL	1.4	17.2	52.5	1.4	3.3	0.7	16.1
RP-5770	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.9	3.2	25.7	54	3.1	2.4	0.8	8.9
s	0.2	0.5	2.0	2.1	0.4	1.4	0.2	1.7
max	2.1	3.9	28.1	57.7	3.6	5.3	1.2	11.7
min	1.6	2.5	22.7	51.2	2.5	1.2	0.5	5.7
RP-5826	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.2	3.6	16.1	59.2	1.6	7.2	0.6	10.2
s	0.6	0.6	1.5	4.8	1.0	2.9	0.1	1.6
max	2.1	4.5	17.3	69.6	3.5	11.1	0.8	12.3
min	0.7	2.9	12.9	55.5	0.8	4.0	0.5	7.7
RP-5862	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.1	2.1	17.8	47.7	6.1	3.5	1.0	13.6
s	0.4	0.8	5.4	14.5	3.1	2.2	0.3	4.1
max	1.6	3.3	22.6	55.1	10	6.6	1.4	17.2
min	0.3	0.6	1.6	2.3	2.9	1.1	0.2	1.4
RP-6365	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.6	2.9	16	53.7	2.7	5.6	0.5	12.8
s	2.0	0.4	9.8	3.5	2.4	3.9	0.6	3.2
max	4.5	3.2	25.7	58.2	6.3	10.9	1.1	16.3
min	BDL	2.3	6.6	49.7	1.1	2.5	BDL	9.7
RP-7199	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.8	2.2	22.6	61	2.3	2.3	0.8	8.1
s	0.8	0.4	2.2	3.2	0.4	0.3	0.1	0.9
max	2.6	2.7	24.9	66.5	3.0	2.8	0.9	9.1
min	BDL	1.5	19	56.8	1.7	1.8	0.7	6.7
RP-7208	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**

mean	1.3	1.9	19.8	57.2	4.0	3.1	1.2	11.5
s	1.3	0.6	2.9	6.3	1.0	1.2	0.6	3.6
max	4.2	2.7	22.6	68.3	5.0	5.1	1.9	15
min	0.4	0.8	13.9	52.3	2.7	2	BDL	4.6
RP-7256	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.8	3.3	21.1	57.7	4.8	4.4	0.8	6.9
s	0.1	0.3	0.8	3.2	0.9	2.3	0.2	1.3
max	0.9	3.8	22.2	61.0	6.7	7.7	1.2	8.9
min	0.6	2.8	20.1	53.4	4.1	2.0	0.5	4.9
RP-7278	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	2.5	2.4	15.5	62.4	4.3	2.7	0.5	9.7
s	1.1	1.0	2.7	7.5	1.4	0.6	0.4	3.2
max	4.4	3.9	19.1	69.0	6.0	3.4	1.0	15.1
min	1.7	1.5	13.3	49.8	2.3	1.9	BDL	7.2
RP-7300	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.2	23	53.9	4.0	2.8	1.2	12.4
s	0.2	0.2	0.5	1.5	1.3	1.1	0.1	0.6
max	0.9	2.6	23.8	56.7	5.7	4.6	1.4	13.4
min	0.4	1.9	22.3	52.8	2.7	2.0	1.0	11.6
RP-7301	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.1	2.9	17.9	54.4	3.7	4.8	1.1	14
s	0.8	0.8	1.4	2.0	0.8	1.2	0.3	2.0
max	2.5	3.7	19.8	57.9	5.1	6.4	1.7	15.5
min	0.6	1.6	16.3	53.1	3.1	3.4	0.8	10.6
RP-7314	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.7	4.0	14.5	55.8	2.5	5.2	0.6	15.6
s	0.1	0.9	1.1	2.0	1.3	3.0	0.6	4.3
max	0.9	5.6	16.0	57.9	3.7	10.2	1.5	18.8
min	0.6	3.4	13.2	54.2	0.8	2.7	BDL	9.9
RP-7359	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	BDL	1.6	22.2	58.3	3.3	1.8	1.1	11.8
s		0.3	1.9	2.5	0.4	0.3	0.3	0.9
max	BDL	2	25.8	62.1	3.9	2.2	1.4	12.6
min	BDL	1.2	20	54.3	2.8	1.3	0.7	10.2
RPP-7427	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.0	3.6	23.9	59.1	2.9	3.2	0.5	5.8
s	0.0	2.0	4.0	1.0	1.0	4.0	0.0	1.0
max	1.3	5.9	26.8	60.7	4.8	9.4	1.0	6.7
min	0.7	2.1	17.8	58	1.7	0.9	BDL	4.5
RPP-7428	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.3	2.6	18.2	65.7	2.2	3	0.8	7.2
s	0.0	1.0	1.0	2.0	0.0	0.0	0.0	1.0
max	0.5	3.2	19.7	67.6	2.4	3.2	1.0	8.2
min	BDL	2.2	17.2	64.2	2.1	2.7	0.8	6.4
RPC-7437	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.0	3.6	23.9	59.1	2.9	3.2	0.5	5.8
s	0.2	1.7	4.2	1.2	1.3	4.1	0.4	1.0
max	1.3	5.9	26.8	60.7	4.8	9.4	1.0	6.7
min	0.7	2.1	17.8	58.0	1.7	0.9	BDL	4.5
RPP-8789	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.5	22	59.5	2.4	4.1	0.7	8.0
s	0.0	0.0	1.0	2.0	0.0	1.0	0.0	1.0
max	0.7	2.9	22.5	61.5	2.6	5.7	0.8	8.7
min	0.5	2.0	21.5	57.8	2.1	2.8	0.7	7.3
RPP-8962	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	1.7	18.8	56	4.1	7.5	1.1	10.3
s	0.0	0.0	2.0	5.0	1.0	5.0	0.0	1.0
max	1.2	2.1	21	65.8	5.5	17.1	1.6	12.2

min	BDL	1.3	14.8	51.8	3.2	3.6	0.7	8.3
RPP-9496	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.4	2.3	21.6	58.9	3.2	3.3	0.9	9.4
s	0.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0
max	0.4	2.4	22.6	60.1	3.4	3.8	1.0	9.8
min	0.4	2.1	20.7	57.0	3.0	3.0	0.8	9.1
RPP-9999	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.0	2.4	20.4	62.6	3.6	2.9	0.7	6.4
s	0.0	0.0	5.0	5.0	0.0	0.0	0.0	1.0
max	1.1	2.8	23.4	67.5	4.1	3.2	0.9	7.1
min	0.8	2.1	17.3	58.8	3.2	2.5	0.5	5.1
RP-10242	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.1	23.2	59.1	1.9	1.3	1.1	10.6
s	0.1	0.3	1.2	1.8	0.2	0.4	0.5	0.8
max	0.9	2.4	24.9	61.9	2.3	2	2.1	11.9
min	0.5	1.7	21.6	56.6	1.8	0.8	0.8	9.5
RP-11341	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.8	5.1	23.7	52.4	0.9	4	0.8	12.2
s	1.0	1.1	0.9	3.1	0.4	1.4	0.4	3.7
max	3.4	7.6	25.5	57	1.8	7.3	1.9	20.7
min	BDL	3.3	22.5	45.4	0.5	2.4	0.4	6.6
ERS-11353	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.6	2.4	21	49.7	9.1	1.2	1.3	13.7
s	0.4	1.9	2.8	2.6	0.7	1.0	0.3	1.7
max	2.0	7.7	24.2	53.8	10.2	2.9	1.8	17.9
min	0.9	1.4	14.1	47.1	8.1	0.4	0.9	12.4
RP-11359	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.0	3.2	20.0	59.2	4.0	3.1	0.7	8.7
s	0.5	0.6	1.6	7.9	0.5	1.8	0.3	4.3
max	1.6	3.9	21.8	74.6	4.8	5.0	1.0	13.3
min	BDL	2.1	17.7	53.2	3.2	BDL	BDL	BDL
RPC-11478	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.2	3.1	13.0	52.0	1.0	21.5	0.3	6.3
s	0.9	0.7	3.7	12.1	0.4	18.1	0.4	2.0
max	2.3	3.9	16.8	65.0	1.4	39.8	0.7	8.1
min	0.4	2.4	9.4	40.0	0.6	4.7	BDL	4.1
RP-12193	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.2	2.9	22.3	62.2	2.6	3.1	0.8	5.8
s	0.3	0.9	1.9	1.9	0.4	0.4	0.2	0.7
max	0.6	5.6	25.2	65.8	3.6	3.6	1.1	7.2
min	BDL	2.2	18.9	59.7	2.1	2.5	0.5	4.7
RP-12239	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.4	3.3	25.2	58.9	2.9	1.1	0.7	6.4
s	0.3	0.1	1.6	1.8	0.2	0.1	0.0	0.1
max	1.6	3.5	26.3	60.2	3.0	1.2	0.7	6.5
min	1.1	3.2	24.0	57.7	2.8	1.0	0.7	6.4
ERS-12456	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.3	3.5	23.4	58.4	4.3	0.7	0.8	7.7
s	0.3	0.3	0.9	2.1	0.8	0.4	0.2	0.6
max	1.6	3.9	24.3	61.9	5.0	1.3	1.2	8.7
min	0.8	3.1	21.5	56.1	2.9	0.0	0.5	7.1
RP-12458	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	3.1	14.3	53.7	3.7	3.5	0.8	19.9
s	0.3	0.4	3.8	4.5	0.9	1	0.2	2.2
max	1.0	3.7	21.1	60.3	5.0	6.2	1.2	23.6
min	BDL	2.3	10.2	48.4	2.4	2.8	0.6	16.7
RP-12473	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.3	1.5	22.4	58.3	1.7	1.6	1.2	13.0

s	0.2	0.1	1.2	1.3	0.4	0.3	0.3	1.2
max	0.5	1.6	24.2	60	2.5	2.1	1.6	14.7
min	BDL	1.2	21.2	56.1	1.3	1.2	0.8	11.5
RP-13007	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.8	4.6	21.3	52.2	2.4	1.7	0.9	14.8
s	1.3	1.5	3.3	4.8	0.9	0.4	0.4	2.9
max	4.1	6.6	25.5	58.9	3.6	2.3	1.4	18
min	0.9	2.9	17.2	46.2	1.3	1.1	0.4	11.3
RPC-13016	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.4	3.9	21.1	51.4	1.4	3.2	0.7	18.0
s	0.3	1.1	2.9	2.0	0.7	1.5	0.2	1.3
max	0.6	5.3	25	54.4	2.1	6.1	0.9	19.7
min	BDL	2.4	17.3	49.2	0.5	2.0	0.5	15.5
RP-13025	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	2.0	21.6	56.7	3.7	3.6	1.2	10.5
s	0.0	0.1	1.0	1.2	0.2	0.3	0.3	0.4
max	0.5	2.1	22.3	58.1	4.0	3.9	1.5	10.9
min	0.5	2.0	20.5	55.7	3.5	3.4	1.0	10.1
RPP-13085	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	1.9	20.5	64.8	3	1.5	0.8	7.0
s	0.0	0.0	5.0	5.0	0.0	0.0	0.0	1.0
max	0.7	2.4	25.6	70.3	3.2	1.7	1.2	8.4
min	0.4	1.6	16.7	60.5	2.8	1.3	0.5	5.9
WPP-14604	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	2.9	22.4	58.2	2.2	2.9	0.6	9.3
s	0.6	3.3	23.6	59.0	2.6	4.9	0.7	10.2
max	0.5	2.6	21.5	56.8	1.7	1.6	0.5	8.8
min	0.0	0.0	1.0	1.0	0.0	2.0	0.0	1.0
PRS-15277	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	BDL	2.8	17.7	51.1	3.8	8.5		15.9
s	BDL	0.0	1.0	4.0	1.0	2.0		1.0
max	BDL	3.2	19.2	55.9	4.6	10		16.4
min	BDL	2.3	16.9	47.8	2.7	6.4		15.2
RPP-15309	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	3.1	22	62.2	2.7	2.4	0.8	6.2
s	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
max	0.61	3.38	23.17	63.19	2.88	2.53	0.89	6.81
min	0.53	2.87	21.42	60.76	2.51	2.34	0.61	5.6
RPP-15316	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	BDL	1.6	16.9	60.4	3.9	2.0	1.2	14.0
s	BDL	0.0	2.0	2.0	0.0	0.0	0.0	1.0
max	BDL	1.9	19.7	62.3	4.5	2.2	1.3	14.7
min	BDL	1.4	14.6	58.3	3.5	1.8	1	13.5
RPP-15337	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	2.6	20.9	59.7	3	2.3	1.2	9.6
s	0.0	0.0	1.0	2.0	1.0	0.0	0.0	1.0
max	0.6	2.9	21.4	61.5	3.6	2.5	1.4	10
min	0.5	2.4	20.4	58.0	2.5	2.2	1.0	9.2
RPP-15461	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.5	20.9	54.5	3.4	3.3	0.8	13.8
s	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0
max	0.8	2.9	21.6	55.4	3.7	3.6	1.0	14.6
min	0.5	2.0	20.2	53.7	3.1	2.9	0.7	13.2
RP-15646	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	1.7	22.4	59.5	3.8	0.7	1.2	10.1
s	0.3	0.3	2.0	2.7	1.0	0.4	0.3	0.6
max	1.0	2.1	25.7	64.6	5.8	1.6	1.7	10.8
min	BDL	1.3	19.1	56.1	2.8	0.3	0.8	9.5

RP-15649	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.4	2.0	19.3	66.8	1.8	1.8	BDL	6.5
s	0.0	0.3	2.1	3.3	0.2	0.1		0.8
max	0.4	2.1	20.8	69.1	1.9	1.9	BDL	7.1
min	0.4	1.8	17.8	64.5	1.7	1.8	BDL	5.9
ERS-15739	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.1	3.5	18.1	52.1	9.3	4.7	1.0	10.2
s	0.1	0.4	1.5	2.8	1	2.3	0.3	1.5
max	1.3	4.4	19.8	58.2	10.7	9.3	1.4	12.9
min	0.9	3.0	16.1	49.8	8.0	2.0	0.7	8.6
RP-15770	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	1.5	4.7	17.5	52.2	2.3	7.6	0.6	12.7
s	1.4	2.5	4.3	6.4	2.0	4.8	0.2	3.5
max	4.3	10.7	23.3	62.7	6.0	18.7	0.8	19.9
min	BDL	2.8	9.5	40.0	0.3	3.0	0.3	8.1
WPP-16234	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.4	23.5	56	2.1	4.2	0.7	10.6
s	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0
max	0.7	2.7	24.2	56.9	2.3	5.5	0.9	11.2
min	0.4	2.3	23.0	55.5	1.7	2.6	0.6	10.2
RPP-16408	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.4	1.7	20.2	55.1	6.0	2.6	1.0	13.1
s	0.0	0.0	1.0	2.0	3.0	0.0	0.0	1.0
max	0.6	2.1	21.3	57.2	9.7	3.3	1.0	13.9
min	0.4	1.5	18.5	52.5	3.7	2.3	0.9	12.5
RPP-16486	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	2.5	20.8	59.1	3.1	3.1	0.9	10.0
s	0.0	0.0	0.0	2.0	1.0	1.0	0.0	2.0
max	0.5	2.8	21.0	60.7	3.5	3.6	1.0	11.6
min	0.5	2.2	20.7	57.6	2.6	2.6	0.7	8.5
RPP-16511	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.6	2.8	23	60.3	3.2	3.2	1.1	5.7
s	0.0	0.0	1.0	2.0	1.0	1.0	0.0	1.0
max	0.7	3.0	24.2	62.3	3.7	4.7	1.5	6.1
min	0.6	2.6	21.9	58.6	2.8	2.7	0.7	5.1
PRS-16533	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.8	3.8	20.8	58	2.2	4.2	0.7	8.6
s	0.0	1.0	1.0	2.0	0.0	1.0	0.0	1.0
max	1.0	4.7	21.7	59.8	2.7	4.7	0.8	10.3
min	0.6	3.4	20.1	56	1.8	3.5	0.5	7.7
RP-16541	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	1.5	21.8	60.8	3.6	1.3	1.0	9.5
s	0.1	0.4	2.5	2.3	2.6	0.2	0.4	2.1
max	0.7	2.0	26.1	63	8.7	1.6	1.7	11
min	0.3	0.9	19.5	57.5	2.1	1.0	0.5	5.6
RP-16543	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	1.4	19.6	57.6	3.8	2.2	1.2	13.7
s	0.1	0.2	1.1	1.8	0.2	0.4	0.1	1.3
max	0.6	1.6	21.0	59.5	4.1	2.7	1.3	15.2
min	0.5	1.1	18.3	55.3	3.7	1.7	1.1	12.1
RPP-16733	**Na_2O**	**MgO**	**Al_2O_3**	**SiO_2**	**K_2O**	**CaO**	**TiO_2**	**FeO**
mean	0.5	2.6	20.5	57.6	3.3	3.6	1.0	10.8
s	0.0	0.0	1.0	2.0	0.0	1.0	0.0	1.0
max	0.6	2.8	21.6	60.3	3.7	5.3	1.2	11.5
min	0.4	2.4	19.1	55.5	3.0	2.0	0.8	10.2